New Mexico Air Quality Bureau

Air Dispersion Modeling Guidelines

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1.0 INTRODUCTION

1.1 Background

Air pollution has been proven to have serious adverse impacts on human health and the environment. In response, governments have developed air quality standards designed to protect health and secondary impacts. The only way to predict if these regulations will be satisfied by a facility or modification that does not yet exist is to use models to simulate the impacts of the project. Regulatory models strike a balance between cost-effectiveness and accuracy, though the field of air quality prediction is not necessarily an inexpensive or a highly accurate field. The regulatory model design is an attempt to apply requirements in a standard way such that all sources are treated equally and equitably.

It is the duty of the NMED/Air Quality Bureau (the Bureau) to review modeling protocols and the resulting modeling analyses to ensure that air quality standards are protected and to ensure that regulations are applied consistently. This document is an attempt to document clear and consistent modeling procedures in order to achieve these goals. Occasionally, a situation will arise when it makes sense to deviate from the guidelines because of special site-specific conditions. Suggested deviations from the guidelines should be documented in a modeling protocol, and the Bureau will attempt to quickly determine if these changes are appropriate.

In general, the procedures in the EPA document, Guideline On Air Quality Models (EPA publication number EPA-450/2-78-027R (revised)) as modified by Supplements A, B, and C should be followed when conducting the modeling analysis. This EPA document provides fairly complete guidance on appropriate model applications. The purpose of this document is to provide clarification, additional guidance, and to highlight differences between the EPA document and New Mexico State modeling requirements.

Please do not hesitate to call the Bureau modeling staff with any questions you have before you begin the analysis. We are here to provide assistance; however, we will not conduct modeling courses. There are many courses offered which teach the principles of dispersion modeling. These courses provide a much better forum for learning about modeling than the Bureau modeling staff can provide.

1.2 The Permitting Process

1.2.1 Modeling Protocol Review

A modeling protocol should be submitted and approved before submitting a permit application. The Bureau will make every attempt to approve, conditionally approve, or reject the protocol within two weeks. Details regarding the protocol are described in section 6.0, Modeling Protocols. Protocols will be archived in the modeling archives in the protocol section until they can be stored with the files for the application.

1.2.2 Permit Modeling Evaluation

When a permit application involving air dispersion modeling is received, the modeling section will make a quick determination to see if it appears complete. This involves checking to see if modeling files are attached and readable and verifying that application forms and modeling report are present. If the analysis is incomplete, the staff will inform the applicant of the deficiencies as quickly as possible. This will halt the permitting process until sufficient information is submitted.

Later, Bureau staff will perform a complete review of the modeling files. This analysis includes a review to make sure that information in the modeling files are consistent with the information in the permit application, and may involve evaluation and modification of DEM data, surrounding sources, receptors, or other aspects of the modeling inputs. If the dispersion modeling analysis submitted with the permit application adequately demonstrates that ambient air concentrations will be below air quality standards and/or PSD increments, the Bureau modeler will summarize the findings and provide the information to the permit writer. If dispersion modeling predicts that the construction or modification causes or significantly contributes to a violation of a New Mexico or National Ambient Air Quality Standard (NMAAQS or NAAQS) or PSD increment, the permit cannot be issued under the normal permit process. Refer to 20.2.72.216 NMAC or contact the Bureau for further information.

The application (including modeling) is expected to be complete and in good order at the time it is received. However, the Bureau will accept general modifications or revisions to the modeling before the modeling is reviewed provided that the changes do not conflict with good modeling practices. Once the modeling review begins, only changes to correct problems or deficiencies uncovered during the review of the modeling will normally be accepted, and the Bureau will provide a deadline by which changes need to be submitted in order to allow for them to be reviewed and for the permit to be issued. No changes to modeling scenarios will be allowed after the review has been completed.

2.0 MODELING REQUIREMENTS AND STANDARDS

2.1 Regulatory Requirement for Modeling

The requirements to perform air dispersion modeling are detailed in New Mexico Administrative Code (NMAC) **20.2.70.300.D.10 NMAC** (Operating Permits), **20.2.72.203.A.4 NMAC** (Construction Permits), and **20.2.74.305 NMAC** (Permits - Prevention of Significant Deterioration). The language from these sections is listed below for easy reference.

Basically, with a construction permit application, an analysis of air quality standards is required, which normally requires air dispersion modeling. In some cases, previous modeling may satisfy this requirement. In these cases, the applicant may seek a modeling waiver from the Bureau. In any case, it is the duty of the applicant to provide the modeling, or the justification for the modeling waiver, or the air quality analysis for non-attainment areas. Operating permit applications for facilities that have not been modeled at their revised emission rates require source alone modeling to demonstrate compliance with NAAQS.

20.2.70.300.D.10 NMAC

(10) For applications which are required under the transition schedule in paragraph (4) of subsection B of 20.2.70.300 NMAC, include a dispersion modeling analysis, using US EPA approved models and procedures, showing whether emissions from the source would cause air pollutant concentrations in excess of any national ambient air quality standard. Air pollutants which are not emitted in significant (as defined in 40 CFR 52.21(b)(23)(i)) amounts during routine operations need not be modeled.

(a) This requirement shall not apply to the following:

(i) A Part 70 source issued a permit under 20.2.72 NMAC, 20.2.74 NMAC, 20.2.79 NMAC after January 1, 1986; or

(ii) A Part 70 source subject to 20.2.14 NMAC, 20.2.16 NMAC, 20.2.19 NMAC, 20.2.31 NMAC, 20.2.32 NMAC if no physical or operational modifications that have resulted in increased particulate matter, sulfur dioxide, or nitrogen oxide emissions have occurred since the time modeling was performed for that facility as part of revisions to those regulations.

(b) The Department may waive modeling with respect to ozone if the Department determines that emissions from the source are not likely to cause ozone concentrations in excess of the national ambient air quality standard.

20.2.72.203.A.4 NMAC

Contain a regulatory compliance discussion demonstrating compliance with each applicable air quality regulation, ambient air quality standard, prevention of significant deterioration increment, and provision of 20.2.72.400 NMAC - 20.2.72.499 NMAC. The discussion must include an analysis, which may require use of US EPA-approved air dispersion model(s), to (1) demonstrate that emissions from routine operations will not violate any New Mexico or National Ambient Air Quality Standard or prevention of significant deterioration increment, and (2) if required by 20.2.72.400 NMAC - 20.2.72.499 NMAC, estimate ambient concentrations of toxic air pollutants.

20.2.74.305 AMBIENT AIR QUALITY MODELING: All estimates of ambient concentrations required by this Part shall be based on applicable air quality models, data bases, and other requirements as specified in EPA's Guideline on Air Quality Models (EPA-450/2-78-027R, July, 1986), its revisions, or any superseding EPA document, and approved by the Department. Where an air quality impact model specified in the Guideline on Air Quality Models is inappropriate, the model may be modified or another model substituted. Any substitution or modification of a model must be approved by the Department. Notification shall be given by the Department of such a substitution or modification and the opportunity for public comment provided for in fulfilling the public notice requirements in subsection B of 20.2.74.400 NMAC. The Department will seek EPA approval of such substitutions or modifications.

2.2 Air pollutants

Emissions of Sulfur Dioxide (SO_2), Total Suspended Particulates (TSP), Particulate matter with an aerodynamic diameter of less than or equal to 10 micrometers (PM10), Particulate matter with an aerodynamic diameter of less than or equal to 2.5 micrometers (PM2.5), Carbon Monoxide (CO), Nitrogen Dioxide (NO_2), Lead (Pb), Hydrogen sulfide (H_2S), and air toxics as listed in 20.2.72 NMAC are pollutants that may require modeling. Ozone and Volatile Organic Compound (VOC) emissions do not currently require a modeling analysis for a PSD minor source.

2.3 Modeling Exemptions and Reductions

2.3.1 Modeling waivers

In some cases, the demonstration that ambient air quality standards and PSD increments will not be violated can be satisfied with a discussion of previous modeling. To avoid modeling fees and/or having the application ruled incomplete, the applicant should request a written modeling waiver from the Bureau before submitting the application. The waiver request should include a discussion of the items in Table 1 and Table 2, below. The Bureau will determine on a case-by-case basis if the modeling waiver can be granted. The waiver discussion and written waiver approval should be included in the modeling section of the application.

If all the goals in Table 1 are satisfied or if the emission rates are below the values in Table 2, then the modeling waiver should be granted. Some waivers that do not meet these criteria may also be granted, but it may take the Bureau more time and consideration before granting such a request. For example, discussions of scaled emission rates and scaled concentrations will be considered for waiver requests.

Table 1. Factors to consider for modeling waiver for previous modeling

Factor	Default Goals for Modeling Waiver
Recent modeling has been performed for the area where the facility is located.	Current model and modeling techniques were used.
The previous modeling is available and predicted concentrations are sufficiently below standards.	Previous modeling predicted less than 95% of each air quality standard and PSD increment.
Surrounding sources have not increased in that area.	No new sources within 800 meters of the facility.
Stack parameters have not changed significantly.	No more than 5% change in any stack parameter.
Emission rate is equal to or lower than previously modeled emission rate.	New emission rate for the facility is within a pound per hour of the previous rate (or decreases by any amount).
Background concentrations have not increased in that area.	No increase in background concentration from that used in the most recent modeling.

The Bureau has performed generic modeling to demonstrate that the following small sources do not need modeling. Permitting staff must approve the total emission rates during the permitting process for this waiver to be valid.

Table 2. Very small emission rate modeling waiver requirements

Type of emissions	Modeling is waived if emissions of a pollutant for the entire facility (including haul roads) are below the amount:
Point source	1.0 lb/hr
Fugitive sources	0.1 lb/hr

2.3.2 General Construction Permits (GCPs)

General Construction Permits do not require modeling. General modeling was performed in the development of these permits.

2.3.3 Streamlined Compressor Station Modeling Requirements

Compressor stations may be eligible for streamlined permits under the authority of **20.2.72.300-399 NMAC**. Streamlined permits have reduced modeling analysis requirements.

Streamlined Compressor Station Location Requirements

Restrictions preventing use of streamlined permits in certain locations are listed in **20.2.72.301 NMAC**. Those restrictions dealing with location are described below.

According to **20.2.72.301.B.4 NMAC**, the facility cannot co-locate with petroleum refineries, chemical manufacturing plants, bulk gasoline terminals, natural gas processing plants, or at any facility containing sources in addition to IC engines and/or turbines for which an air quality permit is required through state or federal air quality regulations.

According to **20.2.72.301.B.5 NMAC**, the facility cannot locate in any non-attainment area for a pollutant that the facility emits. These areas are described in the section below titled, “Non-Attainment Areas”. **20.2.72.301.B.5.3 NMAC** prohibits the location of streamline permit in areas predicted by air quality modeling to have more than 80% of state or federal ambient air quality standards or PSD increments consumed. Table 3, below, is a list of these areas.

Table 3. Areas Where Streamlined Permits Are Prohibited

County	Range	Township	Sections
Chaves	15E	4S	35
Chaves	24E	9S	29
Eddy	26E	18S	26
Eddy	27E	18S	1, 11-13, 17
Eddy	32E	20S	31
Grant	15W	19S	10, 14-16, 21-22, 27-28
Hidalgo	17W	29S	13
Hidalgo	17W	29S	24
Lea	32E	17S	20-21, 28-29
Lea	33E	17S	20, 29
Lea	33E	15S	4-5
Lea	33E	14S	32-33
Lea	34E	18S	1-2
Lea	34E	17S	25-26, 35-36
Lea	35E	21S	1
Lea	35E	21S	12-13
Lea	36E	21S	6-7, 18, 26-27, 34-35
Lea	36E	20S	1-2, 36
Lea	37E	25S	4-5
Lea	37E	24S	5-6, 28-29, 32-33
Lea	37E	23S	31-32
Lea	37E	22S	2-4, 13-14, 27-28, 33-34
Lea	37E	21S	28, 33-35
Lea	37E	19S	29
Lea	37E	15S	2-3, 10-11
Lea	38E	19S	5-6
Lea	38E	18S	31-32
Lincoln	12E	3S	3, 9-11, 15
Luna	11W	24S	3-4, 9
Luna	11W	23S	34
McKinley	17W	15N	9, 16
McKinley	13W	13N	4-5
McKinley	6W	20N	33
Roosevelt	36E	8S	15
San Juan	17W	19N	9-10, 15-16
San Juan	15W	28N	6
San Juan	15W	29N	1
San Juan	12W	26N	15-17
San Juan	11W	28N	13-14
San Juan	11W	29N	14-15

20.2.72.301.B.6 NMAC prohibits the location of streamline permit from use in areas if the nearest property boundary will be located less than:
(a) 1 kilometer (km) from a school, residence, office building, or occupied structure. Buildings and structures within the immediate industrial complex of the source are not included.
(b) 3 km from the property boundary of any state park, Class II wilderness area, Class II national wildlife refuge, national historic park, state recreation area, or community with a population of more than twenty thousand people.

Table 4. List of state parks, Class II wilderness areas, Class II national wildlife refuges, national historic parks, and state recreation areas

County	Name	Type	Min. Distance (km)
Bernalillo	Sandia Mountain Wilderness	State Wilderness	3
Catron	Gila Wilderness	Class I Area	30
Catron	Gila Cliff Dwelling	National Monuments	3
Catron	Datil Well	Recreation Sites	3
Chaves	Bottomless Lake	Class II State Parks	3
Chaves	Bitter Lake National W.R.	Class II Wildlife Refuge	3
Cibola	Bluewater Lake	Class II State Parks	3
Cibola	El Malpais	National Monuments	3
Cibola	El Morro	National Monuments	3
Colfax	Cimarron Canyon	Class II State Parks	3
Colfax	Maxwell National W.R.	Class II Wildlife Refuge	3
Colfax	Capulin	National Monuments	3
DeBaca	Sumner Lake	Class II State Parks	3
DeBaca	Ft. Sumner	State Monuments	3
Dona Ana	Leesburg Dam	Class II State Parks	3
Dona Ana	Aguirre Springs	Recreation Sites	3
Dona Ana	Ft. Seldon	State Monuments	3
Eddy	Carlsbad Caverns National Park	Class I Area	30
Eddy	Living Desert	Class II State Parks	3
Grant	Gila Wilderness	Class I Area	30
Grant	City of Rocks	Class II State Parks	3
Guadalupe	Santa Rosa Lake	Class II State Parks	3
Harding	Chicosa Lakes	Class II State Parks	3
Harding	Kiowa National Grasslands	National Grasslands	3
Lea	Harry McAdams	Class II State Parks	3
Lincoln	White Mountain Wilderness	Class I Area	30
Lincoln	Valley of Fires	Class II State Parks	3
Lincoln	Lincoln	State Monuments	3
Luna	Pancho Villa	Class II State Parks	3
Luna	Rock Hound	Class II State Parks	3
McKinley	Red Rock	Class II State Parks	3
County	**Name**	**Type**	**Min. Distance**

			(km)
Mora	Coyote Creek	Class II State Parks	3
Mora	Ft. Union	National Monuments	3
Otero	Oliver Lee	Class II State Parks	3
Otero	White Sands	National Monuments	3
Otero	Three Rivers Petro	Recreation Sites	3
Quay	Ute Lake	Class II State Parks	3
Rio Arriba	San Pedro Parks Wilderness	Class I Area	30
Rio Arriba	El Vado Lake	Class II State Parks	3
Rio Arriba	Heron Lake	Class II State Parks	3
Rio Arriba	Navajo Lake (Sims)	Class II State Parks	3
Rio Arriba	Chama River Canyon Wilderness	State Wilderness	3
Roosevelt	Oasis	Class II State Parks	3
Roosevelt	Grulla National W.R	Class II Wildlife Refuge	3
San Juan	Navajo (Pine)	Class II State Parks	3
San Juan	Chaco Canyon	National Historic Park	3
San Juan	Aztec Ruins	National Monuments	3
San Juan	Angel Peak (National)	Recreation Area	3
San Miguel	Conchas Lake	Class II State Parks	3
San Miguel	Storey Lake	Class II State Parks	3
San Miguel	Villanueva	Class II State Parks	3
San Miguel	Las Vegas National W.R.	Class II Wildlife Refuge	3
San Miguel	Pecos	National Monuments	3
Sandoval	Bandelier Wilderness	Class I Area	30
Sandoval	Coronado	Class II State Parks	3
Sandoval	Rio Grande Gorge/Fenton Lake	Class II State Parks	3
Sandoval	Bandelier	National Monuments	3
Sandoval	Sandia Crest (State)	Recreation Area	3
Sandoval	Coronado	State Monuments	3
Sandoval	Jemez	State Monuments	3
Sandoval	Sandia Mountain Wilderness	State Wilderness	3
Santa Fe	Hyde Memorial	Class II State Parks	3
Sierra	Caballo Lake	Class II State Parks	3
Sierra	Elephant Butte Lake	Class II State Parks	3
Sierra	Percha Dam	Class II State Parks	3
Socorro	Bosque del Apache Wilderness	Class I Area	30
Socorro	Sevillita National W.R.	Class II Wildlife Refuge	3
Taos	Pecos Wilderness	Class I Area	30
Taos	Wheeler Park Wilderness	Class I Area	30
Taos	Kit Carson	Class II State Parks	3
Taos	Rio Grande Gorge	Recreation Sites	3
Taos	Latir Peak Wilderness	State Wilderness	3
County	**Name**	**Type**	**Min. Distance**

			(km)
Torrance	Manzano Mountain	Class II State Parks	3
Torrance	Grand Guivira	National Monuments	3
Torrance	Quarai at Salinas	National Monuments	3
Torrance	Abo at Salinas	State Monuments	3
Torrance	Manzano Mountain Wilderness	State Wilderness	3
Union	Clayton Lake	Class II State Parks	3
Valencia	Sen. Willie Chavez	Class II State Parks	3
Valencia	Manzano Mountain Wilderness	State Wilderness	3

(c) 10 km from the boundary of any community with a population of more than forty-thousand people, or
(d) 30 km from the boundary of any Class I area;

20.2.72.301.B.7 NMAC prohibits the location of streamline permit in Bernalillo County or within 15 km of the Bernalillo County line.

Streamlined Compressor Station Modeling and Public Notice Requirements

Modeling and public notice requirements for streamlined compressor station permits depend on the amount of emissions from the facility. Refer to the table below, using the maximum of the Potential to Emit (PTE) of each regulated contaminant from all sources at the facility to determine applicability. The potential to emit for nitrogen dioxide shall be based on total oxides of nitrogen. The effects of building downwash shall be included in modeling if there are buildings at the site.

Table 5. Streamlined Permit Applicability Requirements for facilities with less than 200 tons/year PTE

Applicable Regulation	PTE (tpy)	Modeling Requirements (from 20.2.72.301 D NMAC)
20.2.72.301 D (1)	40	• None
20.2.72.301 D (2)	100	• The impact on ambient air from all sources at the facility shall be less than the ambient significance levels.
20.2.72.301 D (3)	200	• Air quality impacts must be less than 50% of all applicable NAAQS, NMAAQS and PSD increments. • There shall be no adjacent sources emitting the same air contaminant(s) as the source within 2.5 km of the modeled NO_2 impact area. • The sum of all potential emissions for NO_X from all adjacent sources within 15 km of the NO_X ROI must be less than 740 tons/year. • The sum of all potential emissions for NO_X from all adjacent sources within 25 km of the NO_X ROI must be less than 1540 tons/year.

There are other criteria that must be met for streamlined permits for compressor stations. Please refer to *New Mexico Guidance for Streamlined Compressor Stations - Categories 1,2* and **20.2.72.300-399 NMAC** for more information.

2.4 Applying the standards to modeling

The following notes discuss how to compare model output with the standards to determine compliance. See also the section on converting concentrations, below.

General notes for Table 6:

- Annual mean: All annual averages are annual arithmetic means, except for TSP, which uses annual geometric mean. The models calculate annual arithmetic mean, so this approximation is normally used for all annual averaging periods.
- H_2S: For modeling ½-hour H_2S NMAAQS, use the 1-hour averaging time because the models cannot resolve less than one hour increments.
- Lead: For modeling quarterly lead averages, use the monthly averaging time unless the model being used has a quarterly averaging period.
- High second high: All short term PSD increments and NAAQS can be modeled as high second high values if the meteorological data used for the site is determined to be representative of the site. High first high values should be used if the data is not considered site specific. For example, no met monitoring stations are available near Raton, New Mexico, and there are terrain features that may make Raton meteorology different from other places. The Bureau will still recommend met data to use for modeling in Raton, but high first high values should be used for this modeling because the met is not completely representative of the area.
- PM10: Use high second high and a single year of representative met data. This is approximately equivalent to the high fourth high specified in the multi-year analysis.
- PM2.5: Use high eighth high and a single year of representative met data. This is approximately equivalent to the 98^{th} percentile.

2.5 Concentration Calculations

Many of the air quality standards are written in the form of parts per million (ppm), but the models generally give output in units of micrograms per cubic meter ($\mu g/m^3$). The following method can be used to determine the criteria for the facility. Note that the concentration is dependent on the elevation of targeted receptors where the concentration is predicted. In order to simplify standard calculation, the elevation of the highest receptor may be used.

2.5.1 Gaseous Conversion Factor for Elevation and Temperature Correction

The following equation calculates the conversion from $\mu g/m^3$ to ppm, with appropriate corrections for temperature and pressure (elevation):

$$ppm = 4.553 \times 10^{-5} \times \frac{C \times T}{M_w} \times 10^{Z \times 1.598 \times 10^{-5}}$$

or, rearranged to calculate $\mu g/m^3$:

$$C = ppm \text{ x } M_W / (T \text{ x } (4.553 \text{ E -5}) \text{ x } (10^{Z \text{ x } 1.598 \text{ E -5}}))$$

where:

C = component concentration in $\mu g/m^3$.
T = average summer morning temperature in Rankin at site (typically 530 R).
M_w = molecular weight of component.
Z = site elevation, in feet.

Table 6. National and New Mexico Ambient Air Quality Standards and Prevention of Significant Deterioration Increments.

Pollutant	Averaging Period	Significance Level[D] ($\mu g/m^3$)	NAAQS	NMAAQS	PSD Increment Class I	PSD Increment Class II
Carbon Monoxide (CO)	8-hour	500	9 ppm (10 mg/m^3) [1]	8.7 ppm		
	1-hour	2,000	35 ppm (40mg/m^3) [1]	13.1 ppm		
Hydrogen sulfide (H_2S)	1-hour	1.0		0.010 ppm[A,1]		
	1/2-hour	5.0		0.10 ppm[B]		
	1/2-hour	5.0		0.030 ppm[C]		
Lead (Pb)	Quarterly	0.03	1.5 $\mu g/m^3$			
Nitrogen Dioxide (NO_2)	annual	1.0	0.053 ppm (100 $\mu g/m^3$)	0.050 ppm	2.5 $\mu g/m^3$	25 $\mu g/m^3$
	24-hour	5.0		0.10 ppm		
Ozone	1-hour		0.12 ppm [6]			
	8-hour		0.08 ppm [5]			
$PM_{2.5}$	annual		15 $\mu g/m^3$ [3]			
	24-hour		35 $\mu g/m^3$ [4]			
PM_{10}	annual	1.0	50 $\mu g/m^3$ [2]		4 $\mu g/m^3$	17 $\mu g/m^3$
	24-hour	5.0	150 $\mu g/m^3$ [1]		8 $\mu g/m^3$	30 $\mu g/m^3$
Particulates (TSP)	annual	1.0		60$\mu g/m^3$ [E]		
	24-hour	5.0		150$\mu g/m^3$		
Sulfur Dioxide (SO_2)	annual	1.0	0.03 ppm	0.02 ppm	2 $\mu g/m^3$	20 $\mu g/m^3$
	24-hour	5.0	0.14 ppm	0.10 ppm	5 $\mu g/m^3$	91 $\mu g/m^3$
	3-hour	25.0	0.50 ppm		25 $\mu g/m^3$	512 $\mu g/m^3$

[A] for the state, except for the Pecos-Permian Basin Intrastate AQCR

[B] for the Pecos-Permian Basin Intrastate AQCR

[C] for within 5-miles of the corporate limits of municipalities within the Pecos-Permian Basin AQCR

[D] Significance levels are listed in **20.2.72.500 NMAC**

[E] annual geometric mean (and see general notes, above)

[1] Not to be exceeded more than once per year.

[2] To attain this standard, the expected annual arithmetic mean PM10 concentration at each monitor within an area must not exceed 50 ug/m^3.

[3] To attain this standard, the 3-year average of the annual arithmetic mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 ug/m^3.

[4] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 ug/m^3.

[5] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.

[6] (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is <= 1, as determined by appendix H.

(b) The 1-hour NAAQS will no longer apply to an area one year after the effective date of the designation of that area for the 8-hour ozone NAAQS. The effective designation date for most areas is June 15, 2004. (40 CFR 50.9; see Federal Register of April 30, 2004 (69 FR 23996).)

2.6 PSD Increment Modeling

2.6.1 Air Quality Control Regions and PSD Baseline Dates

Any facility that is required to provide an air dispersion modeling analysis with its construction permit application is required to submit a PSD increment consumption analysis unless none of its sources consume PSD increment. Table 7 serves as a tool to determine which sources to include in PSD increment modeling.

Table 7: PSD Increment Consumption and Expansion

Sources that do not consume PSD increment	• Temporary emissions (sources involved in a project that will be completed in a year or less). • Any facility or modification to a facility constructed before the PSD major source baseline date. • Any minor source constructed before the PSD minor source baseline date.
Sources that consume PSD increment	• Any new emissions or increase in emissions after the PSD Minor Source Baseline date (for that AQCR and pollutant). • Any new emissions or increase in emissions at a PSD Major source that occurs after the Major Source Baseline Date.
Sources that expand PSD increment	• A permanent reduction in actual emissions from a baseline source.

Notes:

- EPA memos written before the publication of the Draft NSR Workshop Manual indicate that PSD regulations were not intended to apply to temporary pilot projects. The memo clearly indicated that the pilot project did not need a PSD permit.
- If a minor source facility once existed but shut down before the minor source baseline date, then it would not be considered to be part of the baseline.
- Haul road emissions are treated the same way other sources of emissions are treated.
- An increase in emissions due to increased utilization of a facility, such as de-bottlenecking, are treated as any other increase in emissions.
- The Bureau interprets temporary emissions to mean emissions at the location that will occur for less than one year or emissions of standby or emergency equipment that operates less than 500 hours per year. For example, if a series of three gravel crushers operate at a mine for more than one year, and PSD increment modeling should be performed because the mining operations at the location are not temporary in nature, even though none of the of individual crushers remained on-site for an entire year.

Table 8: Minor Source Baseline Dates by Air Quality Control Region

	Air Quality Control Region (AQCR)							
Pollutant	012	014	152	153	154	155	156	157
NO_2	8/10/95	6/6/89	3/26/97	8/2/95	Not Yet Triggered	3/16/88	Not Yet Triggered	Not Yet Triggered
SO_2	8/10/95	8/7/78	5/14/81	Not Yet Triggered	Not Yet Triggered	7/28/78	8/4/78	Not Yet Triggered
PM10	8/10/95	8/7/78	Not Yet Triggered	6/16/00	Not Yet Triggered	2/20/79	8/4/78	Not Yet Triggered

2.6.2 PSD Class I Areas

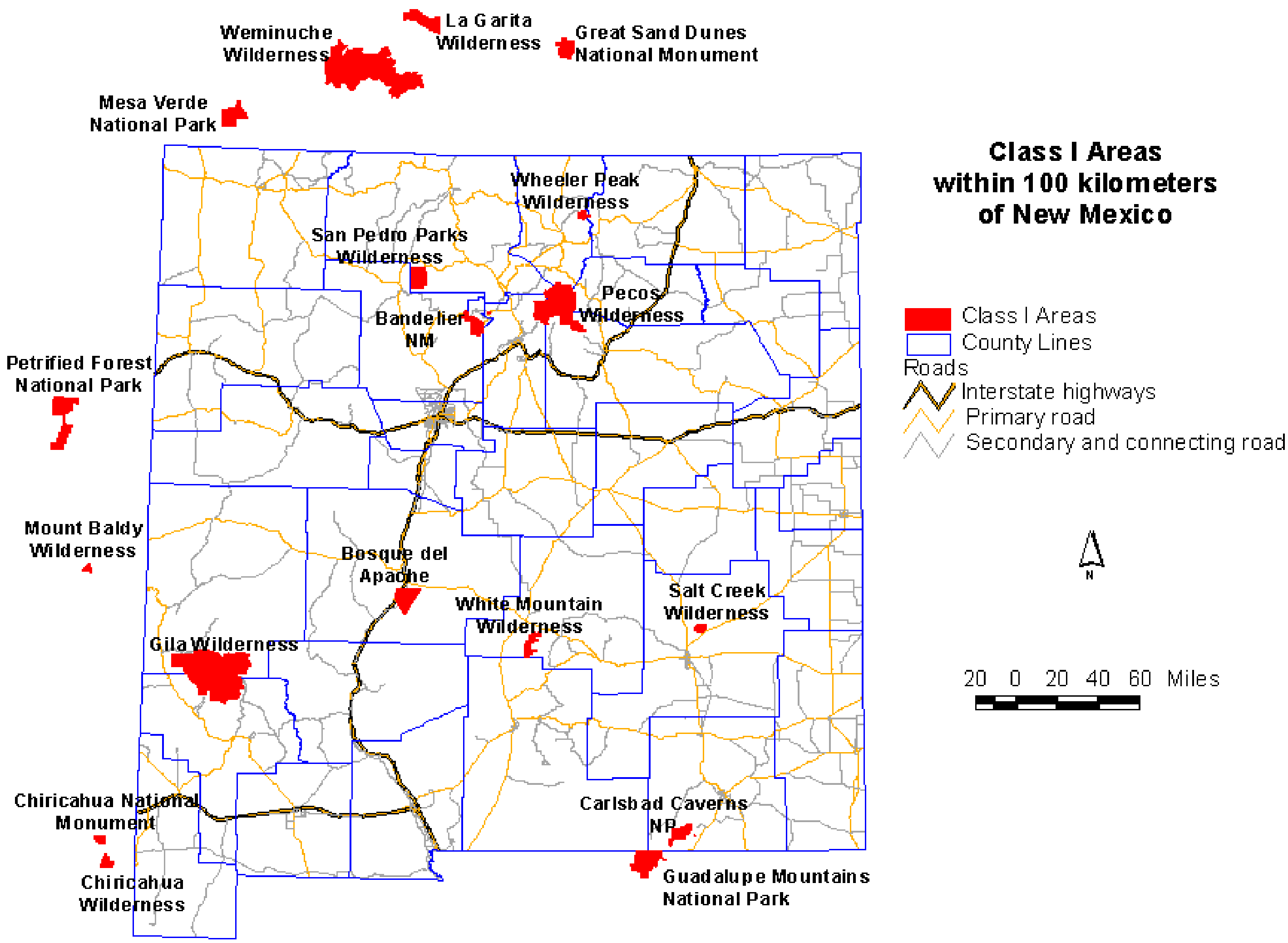


Figure 1: Class I areas

Table 9: Major Source Baseline Dates and Trigger Dates

Pollutant	Major Source Baseline Date	Trigger Date
PM	January 6, 1975	August 7, 1977
SO_2	January 6, 1975	August 7, 1977
NO_2	February 8, 1988	February 8, 1988

2.6.3 PSD Class I Area Proposed Significance Levels

The Envirionmental Protection Agency (EPA) has proposed significance levels for PSD Class I areas. No significance levels have been promulgated, but the Federal land managers (FLMs) are currently accepting the use of this value.

Table 10. Class I Prevention of Significant Deterioration Suggested Significance Levels

Pollutant	Averaging Period	EPA Proposed Significance Level (μg/m^3)	PSD Class I Increment (μg/m^3)
Sulfur Dioxide (SO_2)	annual [a]	0.1	2
	24-hour	0.2	5
	3-hour	1.0	25
PM-10	annual [a]	0.2	4
	24-hour	0.3	8
Nitrogen Dioxide (NO_2)	annual [a]	0.1	2.5

[a] annual arithmetic mean

2.7 New Mexico State Air Toxics Modeling

Modeling must be provided for any toxic air pollutant sources that may emit any toxic pollutant in excess of the emission levels specified in **20.2.72.502 NMAC** - Permits for Toxic Air Pollutants. Sources may use a correction factor based on release height for the purpose of determining whether modeling is required. Divide the emission rate for each release point by the correction factor for that release height on Table 11 and add the total values together to determine the total adjusted emission rate. If the total adjusted emission rate is higher than the emission rate in pounds per hour listed in **20.2.72.502 NMAC**, then modeling is required. The controlled emission rate (not the adjusted emission rate) of the toxic pollutant should be used for the dispersion modeling analysis.

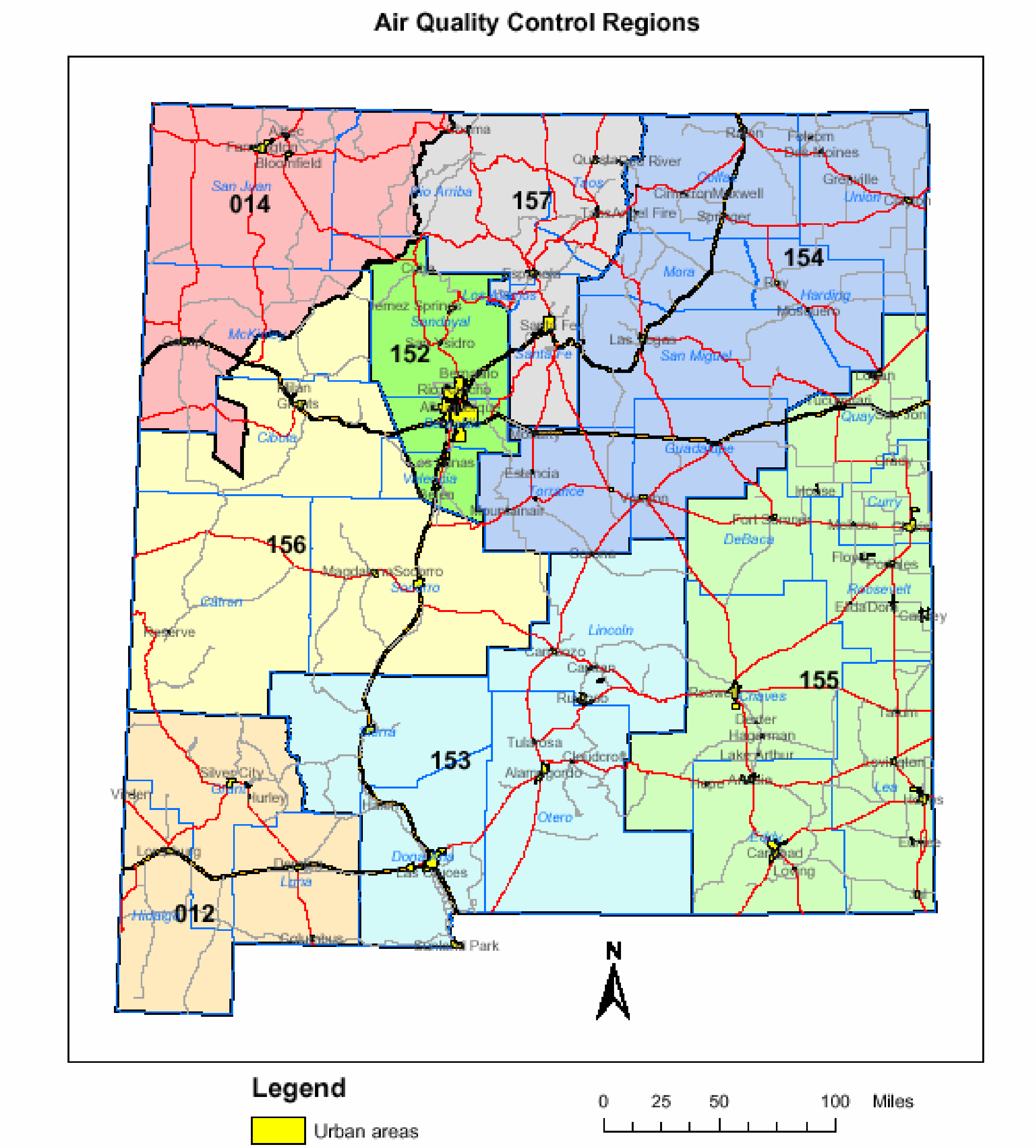


Figure 2: Air quality control regions (each AQCR has a different color)

Table 11: Stack Height Release Correction Factor (adapted from 20.2.72.502 NMAC)

Release Height in Meters	Correction Factor
0 to 9.9	1
10 to 19.9	5
20 to 29.9	19
30 to 39.9	41
40 to 49.9	71
50 to 59.9	108
60 to 69.9	152
70 to 79.9	202
80 to 89.9	255
90 to 99.9	317
100 to 109.9	378
110 to 119.9	451
120 to 129.9	533
130 to 139.9	617
140 to 149.9	690
150 to 159.9	781
160 to 169.9	837
170 to 179.9	902
180 to 189.9	1002
190 to 199.9	1066
200 or greater	1161

The table below lists a few of the commonly encountered State Air Toxics in New Mexico. This is not the complete list, which is too expansive to reprint here.

Table 12: A few common state air toxics and modeling thresholds (from 20.2.72.502 NMAC)

Pollutant	OEL (mg/m^3)	1% OEL ($\mu g/m^3$)	Emission Rate Screening Level (pounds/hour)
Ammonia	18	180	1.20
Asphalt (petroleum) fumes	5.00	50	0.333
Carbon black	3.50	35	0.233
Chromium metal	0.500	5.00	0.0333
Glutaraldehyde	0.700	7.0	0.0467
Nickel Metal	1.00	10.0	0.0667
Wood dust (certain hard woods as beech & oak)	1.00	10.0	0.0667
Wood dust (soft wood)	5.00	50.0	0.333

If modeling shows that the maximum eight-hour average concentration of each toxic pollutant is less than one one hundredth of its Occupational Exposure Level (OEL) listed in **20.2.72.502 NMAC**, then the analysis is finished. For a source of any known or suspected human carcinogens (per **20.2.72.502 NMAC**) which will cause an impact greater than one-one hundredth of the OEL, the source must demonstrate that best available control technology will be used to control the carcinogen. If modeling shows that the impact of a toxic which is not a known or suspected human carcinogen (per **20.2.72.502 NMAC**) is greater than one-one hundredth of the OEL, the application must contain a health assessment for the toxic pollutant that includes: source to potential receptor data and modeling, relevant environmental pathway and effects data, available health effects data, and an integrated assessment of the human health effects for projected exposures from the facility.

2.8 Hazardous Air Pollutants

Hazardous Air Pollutants (HAPs) do not require modeling, as they are regulated by means other than air quality standards. Sources should be aware of the Title V major source thresholds of 10 tons/year for any Hazardous Air Pollutants (HAP) and 25 tons/year for total HAPs, which will require an operating permit to be obtained from the department under **20.2.70 NMAC**- Operating Permits.

2.9 Non-Attainment and Maintenance Areas

In non-attainment areas and for those sources outside of the non-attainment area that significantly contribute to concentrations in a non-attainment area, the non-attainment area permitting process does not include a modeling analysis. Modeling is required in maintenance areas, however. Further information on non-attainment area permitting can be obtained by contacting NSR staff.

2.9.1 Ozone Maintenance Area (Maintenance Plan Pending) in Sunland Park:

The Sunland Park ozone maintenance area is bounded by the New Mexico-Texas State line on the east, the New Mexico-Mexico international line on the south, the Range 3E-Range 2E line on the west, and the N3200 latitude line on the north. EPA designated this area as non-attainment for ozone in July 1995. Due to changes in ozone air quality standards, this area is now classified as a maintenance area, but the maintenance plan has not yet been submitted to EPA. Tentative submittal date is early 2006.

2.9.2 PM-10 non-attainment area in Anthony:

The Anthony PM-10 non-attainment area is bounded by Anthony Quadrangle, Anthony, New Mexico - Texas. SE/4 La Mesa 15' Quadrangle, N32 00 - W106 30/7.5, Township 26S, Range 3E, Sections 35 and 36 as limited by the New Mexico/Texas State line on the south. The State of NM submitted a SIP to the regional EPA headquarters in November 8, 1991.

2.9.3 SO_2 Maintenance area at the Phelps Dodge Smelter

This SO_2 maintenance area is located near the Phelps Dodge Chino Hurley Copper Smelter in Grant County. The maintenance area is defined as a 3.5-mile radius region around the smelter. The maintenance area also includes high elevation areas within an 8-mile radius.

2.9.4 Information on the New Mexico Natural Events Action Plans (NEAPs) for PM10

The Bureau has submitted NEAPs for the counties of Doña Ana, Lea, Luna, and Chaves. EPA will excuse monitored PM10 concentrations above air quality standards if the episode is caused by uncontrollable natural events, provided adequate dust control plans are in place. The NEAP keeps each County from being designated non-attainment. More NEAP information is available at http://www.nmenv.state.nm.us/aqb/NEAP/index.html.

2.9.5 Ozone Early Action Compact in San Juan County

In December 2003, the Bureau, EPA, and local organizations signed an agreement that details strategies for keeping ozone concentrations in San Juan County below air quality standards. The primary goal of this plan is to prevent areas in San Juan County from becoming non-attainment. A Clean Air Action Plan for San Juan County was adopted and submitted to EPA in December 2004.

3.0 MODEL SELECTION

3.1 What dispersion models are available?

The Bureau accepts the use of EPA approved models for dispersion analysis. This section of the modeling guidelines is designed to describe the models that are available and provide some guidance on which situations are the most appropriate for which regulatory modeling situations.

Two types of models are currently in use for air dispersion modeling: probability density function (PDF) models, and puff models. Probability density function models apply a probability function from each emission release point to calculate the concentration at a receptor based on the location of the receptor, wind speed and direction, stability of the atmosphere, and other factors. The plume is assumed to extend all the way out to the most distant receptor, no matter how far that receptor is from the emission source. Because of this characteristic, PDF models suffer in accuracy when modeling distant concentrations or unstable conditions. SCREEN3, ISCST3, ISC_OLM, CTSCREEN, ISC-PRIME, and AERMOD are all PDF models. All but AERMOD use a Gaussian, or normal, distribution for their probability density function. AERMOD uses a PDF that varies depending on nearby terrain and other factors. Currently, AERMOD and CTSCREEN are EPA-approved models for near-field modeling. As of November 9, 2006, SCREEN3, ISCST3, and ISC_OLM are no longer be considered EPA-approved models. The Federal Register notice detailing the promulgation of AERMOD is located at: http://www.epa.gov/scram001/guidance/guide/appw_05.pdf

CALPUFF is a puff model, meaning that it tracks puffs, or finite elements of pollution, after they are released from their source. This strategy makes the model ideal for tracking pollution over long distances or in conditions that are not stable, and also allows chemical reactions within the plume to be modeled. Unfortunately, puff models require large amounts of computing time. CALPUFF is an EPA-approved model for modeling long range transport and/or complex non-steady-state meteorological conditions.

3.2 The 8th Modeling Conference

The 8th Modeling Conference presented a wealth of information about recent regulatory modeling developments. The EPA web page with the details is http://www.epa.gov/scram001/8thmodconf.htm

3.3 Models Most Commonly Used in New Mexico

Most analyses reviewed by the Bureau will begin with an AERMOD analysis, and possibly CTSCREEN for analysis in complex terrain and CALPUFF for Class I analyses. For dispersion modeling within 50 kilometers of the source, AERMOD or CTSCREEN should be used. CALPUFF should be used only for PSD Class I area analyses, per the Interagency Workgroup Air Quality Modeling (IWAQM) Phase II report, but may be approved for use on a case-by-case basis for other analyses.

3.3.1 AERMOD

- AERMOD is intended to be the standard regulatory model. The PRIME building downwash algorithm has been added to the model. Both the Ozone Limiting Method (OLM) and the Plume Volume Molar Ratio Method (PVMRM) algorithms for nitrogen conversion are built into the model.
- AERMOD model takes more time to run than does ISCST3.
- AERMOD has greater accuracy in complex terrain than ISCST3 or CTSCREEN.
- AERMOD is suggested for extremely complex terrain.

See the section on nitrogen oxides for more information and options.

3.3.2 CALPUFF

- CALPUFF is a puff model designed to calculate concentrations at distances up to and beyond 50 kilometers. The model is significantly more difficult to run than the other models discussed in these guidelines. Use of CALPUFF for NAAQS, NMAAQS, or PSD increment modeling must be approved by the Bureau before submitting the modeling.
- CALPUFF is required for additional impact analyses when Federal Land Managers require additional impact analyses for Class I areas near PSD major sources. Typically, CALPUFF light is used for this modeling.

3.3.3 CTSCREEN

- CTSCREEN is applicable only for modeling receptors above stack height.
- CTSCREEN is a difficult model to run because of the difficulty in obtaining hill contour profiles.
- CTSCREEN uses screening meteorology.
- AERMOD produced greater accuracy than CTDMPLUS (the full implementation of CTSCREEN) when modeling the very data that was used to develop CTSCREEN/CTDMPLUS.
- CTSCREEN produces more accurate hilltop concentrations than does ISCST3.
- CTSCREEN is typically used to model the terrain on top of a hill that did not pass when using AERMOD.

The following list can be used to correct 1-hour CTSCREEN concentrations to 3-hour, 24-hour and annual concentrations by multiplying by the appropriate conversion factor for the averaging period.

Table 13: CTSCREEN Correction factors for 1-hour concentration.

Averaging Period	Correction factor
3-hour	0.7
24-hour	0.15
Annual	0.03

3.3.7 RTDM (Rough Terrain Dispersion Model)

- RTDM is a Gaussian dispersion model specifically designed to predict impacts in complex terrain.
- It is rarely used in New Mexico.
- RTDM (Rough Terrain Dispersion Model) may be used in cases where a more refined complex terrain model is required.

4.0 MODEL INPUTS AND ASSUMPTIONS

Models should be used with the technical options recommended in the Guideline on Air Quality Models (http://www.epa.gov/scram001/guidance/guide/appw_03.pdf) except as noted in this document or approved by the Bureau.

Unless otherwise noted, information and procedures in this section refer to all of the models listed above.

4.1 Operating Scenarios

4.1.1 Emission Rates

Averaging periods shorter than annual shall be modeled using the maximum short-term emission rate allowed in the permit. Annual averaging periods may use short-term emission rates scaled down based on the operating time allowed in the permit. The preferred method of modeling all averaging periods is to use maximum short-term emission rates and to use the hours of operation model input option to limit the facility's emissions.

4.1.2 Hours of Operation

If the facility is limited to operating certain hours of the day or has other operating restriction, limiting the operating hours in the model can normally reduce the concentration produced by the model. Hours of operation can only be modeled by models that use actual meteorology, but not by screening models. Use screening models only to model facilities as if the maximum operating rate were emitting continuously.

4.1.3 Operating at Reduced Load

Some sources (like engines and boilers) can produce higher concentrations of pollution in ambient air when they are operating below maximum load than when they are at maximum load. The applicant shall analyze various feasible operating scenarios (100%, 75%, and 50% are typical) to determine the worst-case impacts, and then use that worst-case scenario for the entire modeling analysis. This requirement is in Appendix W of EPA's Guideline.

4.1.4 Alternate Operating Scenario

If the permit application contains multiple operating scenarios (such as use of different fuels or different engines) then the applicant shall model each of the scenarios for the radius of impact analysis. Whichever scenario produces the greatest impacts on ambient air shall be used for the cumulative analysis, if required. If it is unclear which operating scenario produces the greatest impacts, each scenario shall be modeled for cumulative impact analysis.

4.2 Plume Depletion and Deposition

Dry plume depletion may be used to reduce concentrations of particulate matter. Appropriate particle characteristics for the specific type of source being modeled should be used. Contact the Bureau or check the web page for sample meteorological data sets with plume depletion parameters and for sample particle size distributions. Because of the length of time required to run a model with plume depletion, the Bureau recommends only applying plume depletion to receptors that are modeled to be above standards when the model is run without plume depletion.

The wet deposition option should not be used for the modeling analysis unless data are available and the use of wet deposition has been previously approved.

4.3 Meteorological Data.

4.3.1 Selecting Meteorological Data.

For CTSCREEN, worst-case meteorological data is provided with the model. When using other models, the meteorological data used in the modeling analysis should be representative of the meteorological conditions at the specific site of proposed construction or modification.

Representative, on-site data is obviously the best data to use; however, for many sources on-site data is not available. Bureau modeling staff can supply preferred meteorological data sets for various locations around the state. The National Weather Service also collects data throughout the country. These data sets are available through the National Climatic Data Center. It is mandatory that Bureau modeling staff approve the chosen meteorological data before the analysis is submitted. PSD permits contain more rigorous requirements relating to the collection of representative, on-site meteorological data. Either 1 year of representative data which serves as on-site data or 5 years of appropriate off-site data must be used. Please contact the Bureau as soon as possible if you anticipate the need to collect on-site meteorological or ambient monitoring data for a PSD permit.

Setback distance modeling for portable sources may require separate meteorological data than that used in the rest of the modeling for that facility. Preliminary analysis indicates that Bloomfield and La Union met data sets are appropriate for locations throughout the State. Contact the Bureau for guidance on relocation met data selection.

Source locations for meteorological data that the Bureau has processed are shown on the map below.

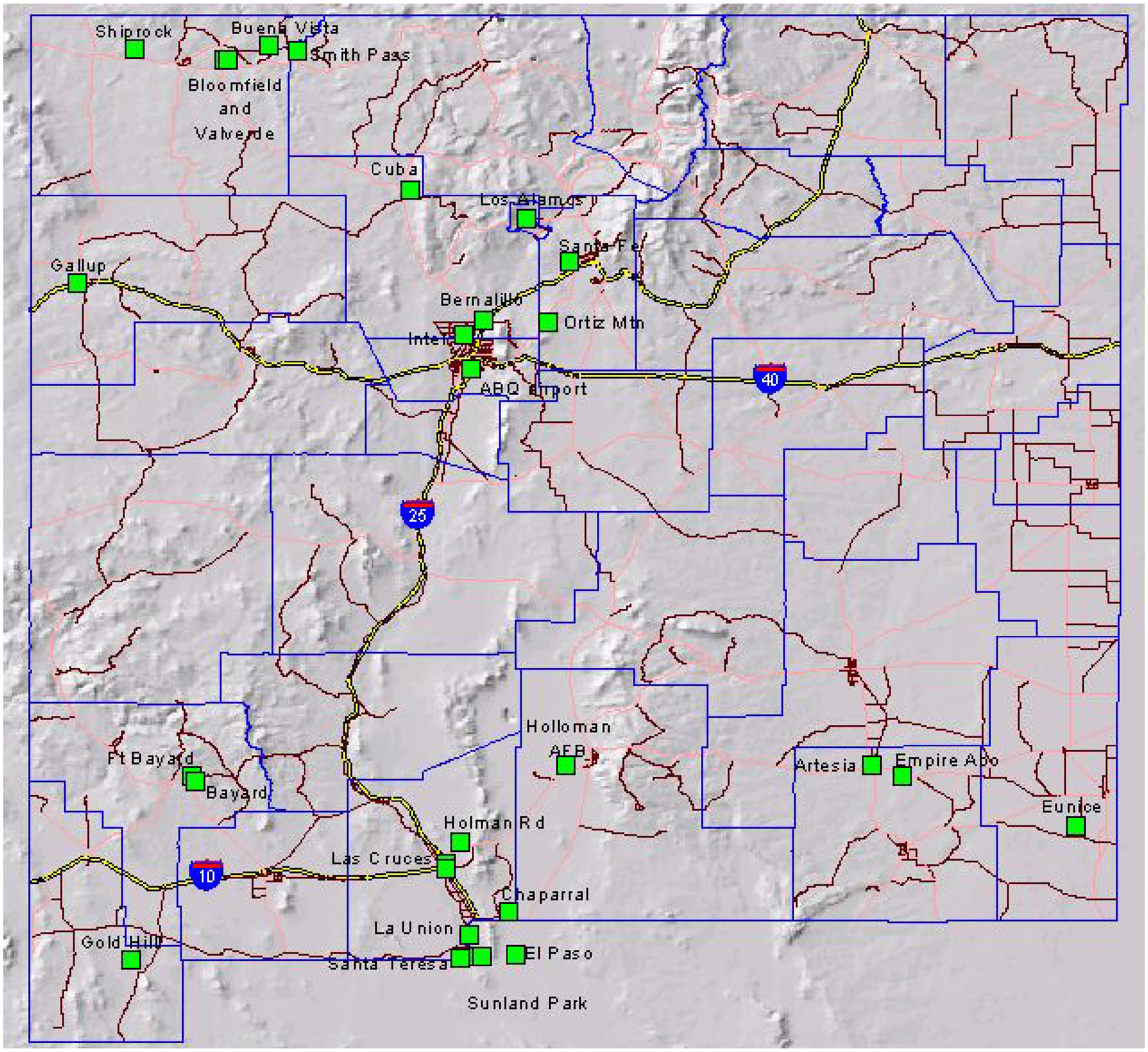


Figure 3: Meteorological Stations in New Mexico

AERMOD advice: Some of the Bureau's meteorological data sets have missing data. To avoid "model crash", use the MSGPRO option and eliminate the DFAULT option in MODELOPT on the CO pathway.

Note: Ozone data is described below in the section on NO_2 modeling.

4.4 Background Concentrations

Background concentrations, if applicable, can be obtained from the Bureau. There are no background concentrations, in general, for NOx, CO and SO_2, unless the source will be very near to Bernalillo County or El Paso.

Table 15, below, lists background concentrations for 24-hour and annual PM10 and TSP impacts. The map was developed from recent (2002) PM10 monitoring data around the state. TSP background concentrations were calculated by multiplying PM10 concentrations by 1.33. The PM10 and TSP background must be added to the impact of the source and any appropriate nearby sources for the NAAQS and the NMAAQS analysis. Do not add ambient background concentrations to PSD increment modeling concentrations, or to facility alone concentrations used to determine radius of impact.

Table 15: Particulate Matter Background Concentrations

Location	PM2.5 background ($\mu g/m^3$)	PM10 background ($\mu g/m^3$)	TSP background ($\mu g/m^3$)
Dona Ana County	12.2	35	46.6
The rest of New Mexico	7.3	20	26.6

4.5 NO_2 Modeling Methodology

4.5.1 NO_2 Reactions

Combustion processes emit nitrogen oxides in the forms of nitrogen oxide (NO) and nitrogen dioxide (NO_2). Only the concentration of NO_2 is regulated by air quality standards; however, emissions of nitrogen oxides ($NO_x = NO + NO_2$) must be modeled in order to estimate total NO_2 concentrations.

NO reacts with ozone (O_3) to form NO_2 according to the following reaction:
$NO + O_3 \rightarrow NO_2 + O_2$
Many other reactions participate in the determination of the stoichiometric atmospheric concentration of NO_2, including the following reaction.
$NO_2 + h\nu$ (energy) $\rightarrow NO + O$

As the plume travels away from the stack, more and more ozone diffuses into the plume, eventually resulting in close to 100 percent conversion of NO to NO_2.

4.5.3 Estimating NO_2 concentrations

The Bureau has approved three techniques, described below, for estimating NO_2 concentrations from NO_x point sources. Any of these techniques can be applied for determining the radius of impact. Note that NO_2 concentrations reported by the emissions inventory are actually NO_X concentrations.

Total Conversion Technique: 100% conversion

This technique assumes all of the NO_X is converted to NO_2. This simple technique is suitable for small facilities where compliance with standards is not a problem.

Fixed Rate Conversion Technique: 75% annual and 40% 24-hour conversion

A fixed rate of conversion may be applied to estimate NO_2 concentrations. The amount of conversion depends on the length of the averaging period. For 24-hour concentrations, a partial conversion rate of 40% is allowed. For annual concentrations, the fixed rate of conversion allowed is 75%, which is the Ambient Ratio Method (ARM) default adopted in the Guideline on Air Quality Models. Site-specific ozone monitoring data may be used to derive an ARM different from the default.

For example, if the 24-hour and annual NO_x concentrations are each 100 $\mu g/m^3$, the NO_2 concentration can be assumed to be 40 $\mu g/m^3$ for the 24-hour averaging period and 75 $\mu g/m^3$ for the annual averaging period.

Ozone Limiting Method Technique

Some sources will need to examine the atmospheric chemistry in a more rigorous manner. The Bureau accepts the Ozone Limiting Method (OLM) to more accurately estimate NO_2 concentrations. OLM assumes that 10% of the NO_X released is in the form of NO_2. This fraction is called "Thermal NO_X" because the temperatures where the reactions occur are primarily responsible for the conversion to NO_2. The remaining 90% of the NO_X is available to react with ozone in the atmosphere. In areas with high ozone concentrations, more NO_X will be converted to NO_2. A concentration of NO will react with an equal concentration of O_3, on a molecular basis, to form NO_2. The total of the two types of NO_2 are added to calculate the predicted NO_2 concentration. Some sources may have higher concentrations of Thermal NO_X than the 10% assumed by the model, but equilibrium reactions tend to mitigate the higher NO_2 concentrations in these cases.

The Bureau recommends the use of AERMOD available on EPA's webpage.

In the past, the Bureau has received analyses which have "double-ozone-limited", meaning that the partial conversion was applied and the Ozone Limiting Method was then applied to the resulting concentrations. This method is incorrect and will result in an incomplete ruling of the application.

Ozone Data

The Bureau can provide maximum 24-hour profiles of ozone concentrations, maximum 24-hour seasonal profiles of ozone concentrations, and in some cases, an hour-by-hour ozone profile for the entire year. Ideally, the analysis will be completed using hourly ozone data that corresponds with the meteorological data.

In absence of hourly ozone data for a region and time period, one of the following ozone data sets may be substituted.

Option 1. Take the maximum one-hour ozone concentration from the geographically nearest full set of ozone data and assume that that ozone concentration exists for every hour of the year (8760 hours).

Option 2. From the geographically nearest full set of ozone data to the facility to be modeled, determine the maximum one-hour ozone concentration that occurs during each hour of the day during the year. The result will be one 24-hour profile that will be repeated for every day of the year. This ozone profile can then be used to ozone-limit each day of the year to calculate 24-hour and annual average concentrations.

Option 3. Ozone concentration dramatically changes in seasons of year: relatively very high during summer and low during winter. From the geographically nearest full set of ozone data to the facility to be modeled, determine the maximum one-hour ozone concentration that occurs during each hour of the day for each season. The result will be four different 24-hour profiles that will be repeated for the entire season that each represents. This ozone profile can then be used to ozone-limit each day of the year to calculate 24-hour and annual average concentrations.

Combined-Plume Option vs. Indivudual-Plume Option

AERMOD provides two options for calculating NO_2 concentrations, the "plume-by-plume" (INDVDL) calculation, and the combined plume (SRCGRP) calculation. In the individual-plume option, the OLM calculates an NO_2 value at a receptor by applying the ambient ozone conversion of NO_X before summing the contributions of all plumes that impact the receptor. In the combined-plume option, the OLM applies the ozone conversion after the NO_X contribution from every plume has been summed.

EPA guidelines require the use of the "plume-by-plume" option unless a demonstration can be made that the plumes merge. The Bureau has accepted a general demonstration that if two plumes are impacting the same receptor at the same time, then the two plumes have merged. If the plumes do not impact the same receptor at the same time, then the plumes have not merged, but both options will calculate the same concentration for that hour. Therefore, the Bureau will accept either INDVL or SRCGP option without additional demonstrations.

Of greater relevance than plume merging is the extent to which ambient air containing a fresh supply of ozone is mixing with the plume as the plume is carried downwind. A paper has been published on this subject, "The Plume Volume Molar Ratio Method [(PVMRM)] for Determining NO_2/NOx Ratios in Modeling", by Pat Hanrahan of the Oregon DEQ. The paper appeared in the November 1999 issue of the AWMA journal.

The extent to which ambient air mixes in with the plume is predicted by the growth of σ_Y and σ_Z with downwind distance. The apparent expansion of a plume is really an expression of the rate at which turbulence mixes ambient air into the plume. Diffusion plays a minor role in determining the penetration of ambient air, hence ozone, into the plume. As the PVMRM paper points out, the extent of NO_2 formation depends on the total amount of ozone and the total amount of NO contained in the cone of dispersion rather than on the ambient level of ozone.

For receptors that are near sources, the plume will not spread out much, not much ozone will mix into the plume, and ambient ozone should be a good approximation of what mixes into the plume. For receptors far from the sources, more ozone will mix into the plume but the plume will be more dilute, so ambient ozone should be a conservative method of estimating conversion to NO_2. The explanation above illustrates why the combined plume option of AERMOD is accepted by the Bureau for receptors at any distance from the source.

Both OLM and PVMRM are available in AERMOD.

4.6 Location and Elevation

Important: Use the same UTM zone and datum for the entire facility. Facilities on the border between two UTM zones must convert all information into one zone or the other.

Make sure that the source location and parameters are the same as those listed in the application form!! This is the most common mistake we see.

4.6.1 Terrain Use

Terrain classifications are defined as follows:

- **Flat terrain** – Terrain with all elevations equal to the base of the source
- **Simple terrain** – Terrain with elevations below stack height
- **Complex terrain** – Terrain with elevations above stack height
- **Intermediate (Complex) terrain** – Terrain with elevations between stack height and plume height (a subset of complex terrain).

Flat terrain should be used if the source base is higher than all the surrounding terrain or if the facility consists primarily of non-buoyant fugitive sources. Simple and complex terrain should be used for all other scenarios.

4.6.2 Obtaining Elevation
Elevation data for receptors, sources, and buildings should be obtained from USGS topographic maps or Digital Elevation Model (DEM) files. USGS DEMs are available for New Mexico in either 7.5-minute or 1-degree formats. It is strongly suggested that the 7.5-minute data be used in dispersion modeling rather than the coarse resolution 1-degree data. Keep in mind that the USGS DEMs can be in one of two horizontal datums. Older DEMs were commonly in NAD27 (North American Datum of 1927) while many of the latest versions in NAD83 (North American Datum of 1983). It is important to use the same source of data for all elevations. Even USGS 7.5-minute maps and USGS 7.5-minute DEM data may differ. Surrounding sources' elevations provided by the Bureau have been determined using 7.5-minute DEM data (NAD83), where available, and 1-degree DEM data elsewhere.

Elevations should be included for at least all receptors within 10 km of your facility or within your facility's ROI (whichever is smaller). Your source's elevation may be used for receptors beyond 10 km, but it may be wiser to use actual DEM elevations for the entire ROI because surrounding sources are provided with actual elevations.

4.7 Receptor Placement
4.7.1 Elevated Receptors on Buildings
Elevated receptors should be placed on nearby buildings at points of public access where elevated concentrations may be predicted. Use flagpole receptors in areas with multi-story buildings to model state and federal standards. In cases where nearby buildings have publicly accessible balconies, rooftops, or similar areas, the applicant should consult with the Bureau modeling staff to ensure proper receptor placement. PSD increment modeling runs need not consider receptors elevated above ground level.

4.7.2 Ambient Air
Ambient air is defined as any location at or beyond the fence line of the facility. The fence line must restrict public access by a continuous physical barrier, such as a fence or a wall. If plant property is accessible to the public or if any residence is located within the restricted area, receptors should be located on-property.

4.7.3 Receptor Grids
The Bureau suggests the use of Cartesian grids designed in accordance with Table 16 should result in an acceptable analysis. There are cases where deviating from these settings is reasonable, and the deviations should be documented and approved in a modeling protocol. Discrete receptors should be added at any sensitive areas and at residences within the property boundary of the facility. Areas with concentrations above 75% of any of the applicable standards should have receptor spacing in that area equal to the finest spacing described in Table 16.

Receptor grids for the radius of impact analysis must extend beyond the radius of impact in all directions. Receptor grids for cumulative impact analysis must extend up to the radius of impact of the facility. Please use Cartesian grids with actual UTM coordinates. Figure 4 shows an example of receptor grids.

For sources with an ROI greater than 50 kilometers, the grid should extend out beyond 50 km despite the fact that EPA's *Guideline on Air Quality Models* indicates that the useful distance for some guideline models is 50 kilometers. Due to the resource-intensive nature of long-range transport models and the need to estimate ambient concentrations at distances greater than 50 km, the Bureau suggests using AERMOD, or other guideline models for estimating concentrations at distances greater than 50 km from the source. This should result in conservative estimates of impacts at distances greater than 50 km from the source. Receptor grids need not extend beyond 100 km from the source.

Table 16: Receptor Spacing Recommendations

Spacing Category	Spacing Distance (m)	Receptor Locations
Very fine	50	On the fence line and within 500 meters of the facility fence line. This receptor spacing should also be used to demonstrate that maximum concentrations have been determined in areas with “hotspots”.
Fine	100	From where the finer receptors end out to 1 kilometer beyond the fence line of each modeled source within the ROI.
Medium	250-500	Should begin 1 kilometer beyond the fence line and end 5 kilometers from the fence line of each modeled source within the ROI
Coarse	1000	Should begin 5 kilometers beyond the fence line of each source modeled and end at the ROI.

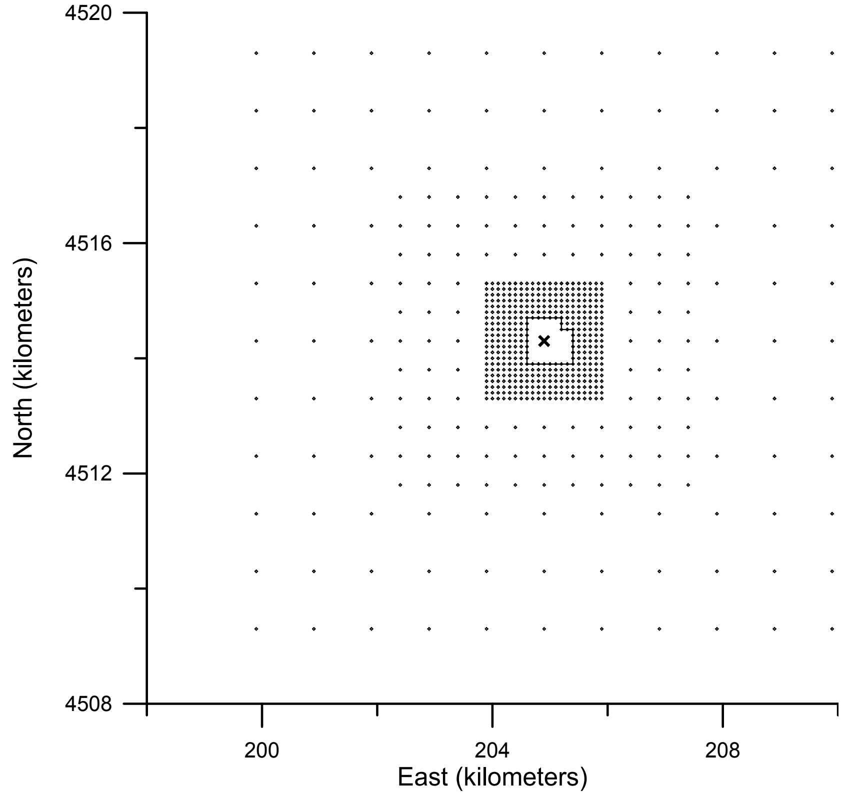


Figure 4. Example of a simple terrain receptor grid consisting of a coarse (1 km increments), medium (500 m increments), and a fine mesh (100 m increments) with the facility source at the center.

4.7.4 PSD Class I Area Receptors

A modeling analysis of the PSD increment consumed at the nearest Class I areas must be performed by sources in AQCRs where the PSD minor source baseline date has been established, or in any AQCR where a new PSD-major source is to be installed. Recommendations for placement of Class I receptors depends on the size of the facility and its distance to Class I areas, as described in Table 17, below. If concentrations are above 75% of the PSD increment, then Fine grid spacing should be used near the hot spots.

Table 17: Class I Receptor Recommendations

Distance from Class I area (km)	Recommended Receptor Placement
Less than 25 for minor sources. Less than 50 for PSD Major sources.	Place receptors along the boundaries of the Class I areas with Medium spacing and in the interior with Coarse spacing.
25 to 50 for minor sources	Place receptors along the boundaries of the Class I areas with Coarse spacing.
50 to 100 (for PSD Major sources only).	Place receptors along the boundaries of the Class I areas with Medium spacing and in the interior with Coarse spacing.

Lists of Class I area receptors can be obtained from the Bureau. See Figure 1 for locations of Class I areas.

4.7.5 PSD Class II Area Receptors

Other than areas that are designated as PSD Class I areas, the entire state of New Mexico is a Class II area. The receptor grid for the PSD Class II increment analysis should be the same as the one for the cumulative run.

4.8 Building Downwash and Cavity Concentrations

Building downwash should be included in the analysis when stack height is less than good engineering practice (GEP) stack height and there are buildings, tanks, fans or other obstacles near the facility. All buildings and structures should be identified and analyzed for potential downwash effects. NMED requires the use of BPIP or equivalent for this analysis. GEP stack height should be determined as per 40 CFR 51.100. For receptors very near buildings, a cavity region analysis may be required. Modelers should consult with the Bureau modeling staff.

As summarized from 40 CFR 51.100:
GEP stack height is the greater of:

1) 65 meters, measured from the ground-level elevation at the base of the stack

or

2) H + 1.5L

Where
H = Height of nearby structure(s) measured from the ground-level elevation at the base of the stack.
L = The lesser of the height or the projected width (width seen by the stack) of nearby structures.

Nearby structures can be as far as 5 times the lesser of the width or height dimension of the structure, but not greater than 0.8 km.
Stacks taller than GEP stack height should be modeled as if they were GEP stack height.

4.9 Neighboring Sources/Emission Inventory Requirements

4.9.1 Obtaining Neighboring Sources Data

The Emissions Inventory of neighboring sources is used as input data in air quality models. This data will be provided by the Bureau within a few days of request. For information on how to request and use the data, see the document, "NM Surrounding Source Format and Options", on the web page. This document describes the format of the data, procedures for eliminating sources, handling errors detected in the data, and neighboring source data from other states.

4.9.2 Source Groups

It often saves considerable analysis time to set the model up to run with multiple source groups. The following groups are recommended.

- **Source alone group** – contains the entire facility and all modifications. This group determines if the facility is above significance levels at the location and time.
- **Cumulative sources group** – contains all allowable emissions of the source and surrounding sources. This group is used to determine compliance with NAAQS and NMAAQS.
- **PSD sources group** – contains all sources that consume or expand PSD increment. This group is used to determine compliance with PSD increment regulations.

Impacts from different groups can be compared to determine if a source contributes significant concentrations if there is a problem complying with air quality standards.

5.0 EMISSIONS SOURCE INPUTS

This section describes appropriate modeling for many types of sources. Additional guidance can be found in the User's Guide for the AMS/EPA Regulatory Model - AERMOD (EPA, 2004, http://www.epa.gov/scram001/dispersion_prefrec.htm).

5.1 Emission Sources

There are two general types of sources:

Sources that come from a stack or vent – stack sources, or point sources;
And sources that don't – fugitive sources.

5.2 Stack Emissions/Point Sources

All stacks should be modeled as point sources, as detailed below.

5.2.1 Vertical Stacks

Stacks that vent emissions vertically should be modeled as point sources with stack parameters that will simulate the manner in which emissions are released to the atmosphere:

Stack exit velocity, V_s = average upward velocity of emissions at the top of the stack;
Stack diameter, d_s = stack exit diameter;
Stack exit temperature, T_s = average temperature of emissions at the top of the stack;
Stack height, H_s = stack release height.

5.2.2 Stacks with Rain Caps and Horizontal Stacks

Stacks that vent emissions horizontally and/or have rain caps should be modeled as point sources with stack parameters that will simulate the manner in which emissions are released to the atmosphere:

Stack exit velocity, V_s = 0.001 m/s;
Stack diameter, d_s = 1m;
Stack exit temperature, T_s = 0 K, or optionally actual temperature for stacks with high temperature;
Stack height, H_s = release height.

AERMOD will set the temperature to ambient temperature if the stack exit temperature is set to 0 K. If the model being used does not do this, then set the temperature to ambient temperature or to a close approximation thereof.

If modeling only horizontal stacks that are not capped, turn stack tip downwash off, whether there are buildings or not. Stack tip downwash calculations are inappropriate for horizontal stacks. If only some stacks have rain caps or are horizontal and others release upward without caps, use stack tip downwash.

Optionally, for modeling only vertical stacks that are capped, turn stack tip downwash off and reduce the stack height by three times the actual stack diameter. The cap will probably force stack tip downwash most of the time. The maximum amount of the stack tip downwash (as calculated in ISC2) is three times the stack diameter. Reducing the stack height by this amount, while turning off the stack tip downwash option, causes the maximum stack tip downwash effect. (Joseph A. Tikvart, 1993)

5.2.3 Flares

Both process and emergency flares should be modeled for comparisons with NAAQS and NMAAQS. If parts of the facility will be shut down when the flare operates then those emission units may be omitted from the flare modeling.

Flares should be treated as point sources with the following parameters:

Stack velocity = 20 m/s = 65.617 ft/s
Stack temperature = 1000°C = 1832°F
Stack height = height of the flare in meters
Effective stack diameter in meters= $D = \sqrt{10^{-6} q_n}$
where $q_n = q(1 - 0.048\sqrt{MW})$
and q is the gross heat release in cal/sec
MW is the weighted by volume average molecular weight of the mixture being burned.
(SCREEN3 Model User's Guide, 1995)

Flares in the surrounding sources inventory from the Bureau should already have an effective diameter calculated; so the parameters in the inventory can be entered directly into your model input "as is". There are other methods for analyzing impacts of flares; if you wish to use another method, check with the Bureau modeling staff first.

NOTE: The NAAQS cannot be violated, even during upset conditions. All emergency flares should be modeled to show compliance with the NAAQS short-term standards under upset conditions. Emergency flares should be modeled with surrounding sources, but not including neighboring emergency flares and other sources that operate less than 500 hours per year.

5.3 Fugitive Sources

5.3.1 Aggregate Handling

Aggregate handling emissions consist of three separate activities, namely: loading material to and from piles, transportation of material between work areas, and wind erosion of storage piles.

Loading material to and from piles should be modeled as volume sources representative of the loading or unloading operation. Emission for loading and unloading are calculated using AP-42 Section 13.2.4. The loading and unloading each involve dropping the material onto a receiving surface, whether being dropped by a dump truck, a front-end loader, or a conveyor. Each drop should be modeled as described in Fugitive Equipment Sources, below.

Transportation of material between work areas should be modeled according to haul road methodology if vehicles are used to transport the material, or using transfer point methodology if conveyors are used to transport the material, as described in Fugitive Equipment Sources, below.

Wind erosion of storage piles should not be modeled, as it says in AP42 not to use the equations for wind erosion in a steady state model.

For the following example facility, aggregate is handled 6 times:

1- a pile in front of the mine face is created,
2- a pile in front of the mine face is loaded into trucks or conveyors,
3- a pile in front of the processing equipment (crusher or HMA) is created,
4- loading the equipment (crusher or HMA),

5- a pile after the equipment, and
6- loading the truck

1 and 2 would not apply if on-site mining does not occur.
5 may be considered a transfer point (conveyor) instead of aggregate handling if controls are applied.
5 and 6 may not apply for HMA plant, as material is bound in asphalt.
6 would not apply if the "waste" pile is left on site.

5.3.2 Fugitive Equipment Sources

Emissions coming from equipment such as crushers, screens, or material transfer points should be modeled as volume sources. Emission rates are normally calculated using AP42 factors.

The release height (H) is the distance from the center of the volume to the surface of the ground. The base of each volume source must be square. For elongated sources, use a series of volume sources with square bases. Determine the apparent size of a volume source by estimating how large the plume would look to an observer. Consider the movement of the plume source during the course of an hour when determining the apparent size. For example, if the source of emissions is from disturbances on a pile, and the entire pile is disturbed at some point in the hour, then use the size of the pile as the apparent size instead of the area of the pile that would be disturbed at any one instant. The reason for this is that the model operates in one-hour blocks of time, so using instantaneous sizes could inaccurately target nearby receptors with elevated emission concentrations.

For a single volume source, divide the apparent length by 4.3 to determine the initial lateral dimension (σ_{Yo}) to input into the model. For a line source represented by a series of volume sources, divide the distance between the centers of adjacent sources by 2.15 to determine σ_{Yo}.

For a source on the ground, divide the vertical dimension of the source by 2.15 to determine the initial vertical dimension (σ_{Zo}) to input into the model. For a source on or connected to a building, divide the height of the building by 2.15 to determine the σ_{Zo}. For an isolated elevated source, divide the vertical dimension of the source by 4.3 to determine the σ_{Zo}.

Example sources are described in the table below. Some sources will vary from the characteristics listed in the table.

Table 18: Example Dimensions of Fugitive Sources

Source Type	Height of Volume (m)	σ_{Zo} (m)	Release Height (m)	Width of Volume (m)	σ_{Yo} (m)
Crusher	5	2.33	6	5	1.16
Screen	5	2.33	4	5	1.16
Transfer point	2	0.93	2	2	0.47
Elevated transfer point	4	0.93	4	2	0.47
High Elevated transfer point	4	0.93	8	2	0.47
Concrete truck loading	5	2.33	4	5	1.16

5.3.3 Haul Roads

Traffic carrying materials mined or processed at the facility must be modeled as part of the facility. Haul roads to be modeled include the portion of roads that are not publicly accessible. Haul road emissions should be modeled as a series of volume sources, as recommended in the AERMOD User's Guide (EPA, 2004, http://www.epa.gov/scram001/dispersion_prefrec.htm). Alternatively, the Bureau has approved the use of area sources for modeling haul roads. A procedure to develop model input parameters follows (adapted from Texas, 1999). The applicant can use other procedures on a case-by-case basis but must demonstrate that those procedures would be appropriate.

Volume Source Characterization: Follow the instructions described below.

Volume height:

The height of the volume (H) will be equal to twice the height of the vehicle generating the emissions—round to the nearest meter.
The initial vertical sigma (σ_{Zo}) is determined by dividing the height of the volume by 2.15.
The release height is determined by dividing the height of the volume by two. This point is in the center of the volume.

Table 19: Example Haul Road Vertical Dimensions

Vehicle size	Truck Height	Height of Volume	σ_{Zo}	Release Height
Large trucks	4 m (13.1 ft)	8 m (26.2 ft)	3.72 m (12.2 ft)	4 m (13.1 ft)
Small trucks	2 m (6.6 ft)	4 m (13.1 ft)	1.86 m (6.1 ft)	2 m (6.6 ft)

RH = H/2 = Release Height above the ground (m). It's the center of the volume source. Also use this for the source height of the area source, if using the area source alternative.
σ_{Zo} = H/2.15 = initial vertical dimension of the volume (m)

Road width:

The adjusted width of the road (W) is the actual width of the road plus 6 meters. The additional width represents turbulence caused by the vehicle as it moves along the road. This width will represent a side of the base of the volume. Use W for the width of the area source, if using the area source alternative.

The initial horizontal sigma (σ_{Yo}) for each volume is determined as follows:

- If the road is represented by a single volume, divide W by 4.3.
- If the road is represented by adjacent volumes, divide W by 2.15.
- If the road is represented by alternating volumes, divide the distance between the center point of one volume to the center point of the next volume by 2.15. $\sigma_{Yo} = 2W/2.15$ This representation is often used for long roads.
- If using area sources, the aspect ratio (i.e., length/width) should be less than 10 to 1. Subdivide the sources if they are too long.
- If using area sources, model each road segment as a straight line. Do not create a road segment with a bend in the road – divide the road into different segments when bends occur.

Road length:

The sum of the length of all volume sources should be about equal to the actual road length, unless the road is very long and half the segments are skipped to save time. The volume sources should be evenly spaced along the road and should be of equal size for a given road. It is acceptable to artificially end the haul road up to 50 meters before the intersection with a public road. The reduced length of the road is due to the observation that vehicles normally slow down or stop before exiting the property. All emissions from haul roads must be modeled, however.

The two lateral dimensions (length and width) of a volume source should be equal. The number of volume sources, N, is determined by dividing the length of the road (optionally minus 50 meters) by W. The result is the maximum number of volume sources that could be used to represent the road. If N is very large, modeling time can be reduced by using alternating volume sources to reduce the number of sources.

Table 20: Example Haul Road Horizontal Dimensions

Vehicle size	Width of Volume	Length of Volume	σ_{Yo}
Large trucks	13 m (42.65 ft)	13 m (42.65 ft)	W/2.15 = 6.05 m (19.85 ft)
Small trucks	10 m (32.8 ft)	10 m (32.8 ft)	W/2.15 = 4.65 m (15.26 ft)

Road location:

The UTM coordinates for the volume source are in the center of the base of the volume. This location must be at least one meter from the nearest receptor.

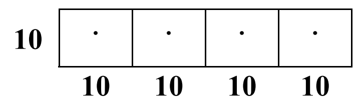
Emission Rate:

Divide the total emission rate equally among the individual volumes used to represent the road, unless there is a known spatial variation in emissions. Use the emissions calculated from the entire road length, even if you artificially end the road volume sources early before exiting the facility.

Example sources:

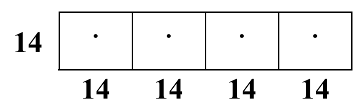
Use of the following modeling parameters should result in acceptable haul road modeling. Different facilities have different sized trucks, roads, and other variables. It is acceptable to use facility-specific parameters

Example One-Way Road Source



(looking from above)
Width = W = 10 m (32.8 ft)
σ_{Yo} = W/2.15 = 4.65 m (15.26 ft)
Figure 5: One-Way Road Source

Two-Way Road Source



(looking from above)
Width = W = 14 m (45.9 ft)
σ_{Yo} = W/2.15 = 6.51 m (21.4 ft)
Figure 6: Two-Way Road Source

Additional guidance can be found in Volume II of the User's Guide for ISC3 model (EPA, 1995).

5.3.4 Area Sources

Sources that have little plume rise may be modeled as area sources. Examples are: storage pile emissions, waste lagoon emissions, or gaseous emissions from landfills. Area source types include rectangle, circle, and irregularly shaped polygon. The model uses only the portion of the area source that is upwind of the receptor for calculating emissions for the hour, so it is safe to put receptors inside the area source without overly magnifying concentrations. The ISC input file uses emissions per area, but front-end programs for developing input files may calculate this for you based on total emissions from the source. For additional information, see the ISC User's Guide (EPA, 1995d).

Extremely long or odd-shaped (like a giant "L") area sources should be broken up into smaller area sources or modeled as a series of volume sources, because they may misrepresent emissions. Area sources, such as AREACIRC sources, may require many times as long to run the model as do volume or point sources in AERMOD.

5.3.6 Open Pits

The open pit source type should only be used to model open pits (not elevated trash dumpsters or anything else that somewhat resembles an open pit). The elevation of the pit entered into the model is the elevation of the top of the pit, which should be ground level.

The model calculates the effective depth of the pit by dividing the pit volume by the length and width of the pit. Release height above the base of the pit must be smaller than this value. Emissions from the bottom of the pit are expressed with a release height of zero.

Pit length should be less than 10 times the pit width. However, a pit cannot be sub-divided because the model needs to calculate mixing done throughout the pit. If the pit is irregular in shape, use the actual area of the top of the pit to calculate a rectangular shape with the same area.

Do not place receptors inside a pit.

The model input file requires pit emission rates to be expressed in mass per time per area [i.e., $g/(s \cdot m^2)$]. Model input front-end programs may convert actual emission rate into area-based emission rates automatically, however.

5.3.7 Landfill Offgass

Decomposition of landfill material can result in the release of gasses such as H_2S. If these gases are not collected using a negative pressure system and flared, then the area of the landfill that is releasing gas can be modeled as an area or a circular area source. If gas is collected by a negative pressure collection system and flared, then model the flare the same way other flares are modeled. Place large area sources in areas that have little effect from the negative pressure collection system. In either case, elevation of the source should be equal to that of the surface, and release height should be zero because they are released from the ground and are not significantly affected by turbulence caused by vehicles traveling over the off-gasses.

6.1 Submittal of Modeling Protocol

A modeling protocol should be submitted prior to the performance of a dispersion modeling analysis. For PSD applications, a modeling protocol is mandatory, and must be sent to NMED/AQB for review and comment. Consultation with Bureau modeling staff regarding appropriate model options, meteorological data, and neighboring sources is recommended for minor sources also, and can be accomplished in writing or by phone. The applicant should allow two weeks for the Bureau to review and respond to the written protocol. To avoid delays caused by misinterpretation or misunderstanding, we strongly recommend consultation with our staff on the following topics:

a.) Choice of models;
b.) Model input options;
c.) Terrain classification (flat or simple and complex);
d.) Receptor grids;
e.) Source inventory data;
f.) Minor source baseline dates for modeling increment consumption;
g.) Nearby Class I areas;
h.) Appropriate meteorological data;
i.) PM10 and TSP background concentrations;
j.) Setback distance calculation if a proposed facility is a portable fugitive source;
k.) Any possible sources of disagreement;

Important: Modeling that substantially deviates from guidelines may be rejected if it is not accompanied by a written approved modeling protocol.

The input data to the models will be unique to the source. Data will usually consist of 1) emission rates and stack parameters for the proposed source at maximum load capacity and at reduced load capacity; 2) emission parameters of sources in the area; 3) model options; 4) suitable meteorological data; 5) definition of source operation which creates the greatest air quality impacts if other than maximum load conditions; and 6) terrain information, if applicable. Very important: **The emission parameters used in the modeling analysis of the proposed source are normally the same as those in the permit application. Any difference between the two should be clearly documented and explained.** Failure to adhere to this rule may result in an incomplete analysis.

6.2 Protocol ingredients

The shortest acceptable modeling protocol would be a statement that the modeling guidelines will be followed and a statement of what meteorological data will be used. Ask the modeling section or check the web page for the latest sample protocols.

6.3 How to submit the protocol

E-mail the modeling protocol to the modeling manager: Sufi.Mustafa@state.nm.us

7.0 DISPERSION MODELING PROCEDURE

Note: The basic steps for performing the modeling are presented in sequential format. Sometimes, it will make sense to perform some of the steps out of order. The sequential modeling steps are designed as an aid to modeling, not a mandatory requirement.

It is important to have an approved modeling protocol before proceeding. Modeling that substantially deviates from guidelines may be rejected if it is not accompanied by a written approved modeling protocol.

7.1 Step 1: Determining the Radius of Impact

A facility's significance area is defined as all locations outside of its fence line where the facility produces concentrations that are above the significance levels listed in Table 6. A facility is deemed culpable for concentrations that exceed air quality standards or PSD increments that occur at a receptor if the facility's contribution is above the significance level at the same time that the exceedance of air quality standards or PSD increments occurs.

The Bureau uses the Radius of Impact (ROI) to make sure the entire significance area is analyzed and to help determine which surrounding sources to include. The ROI is defined as the greatest distance from the center of the facility to the most distant receptor where concentrations are greater than significance levels.

An illustration of determining an ROI from modeling output is shown in Figure 7, below. Note that the entire ROI is completely contained within the receptor grid, as required.

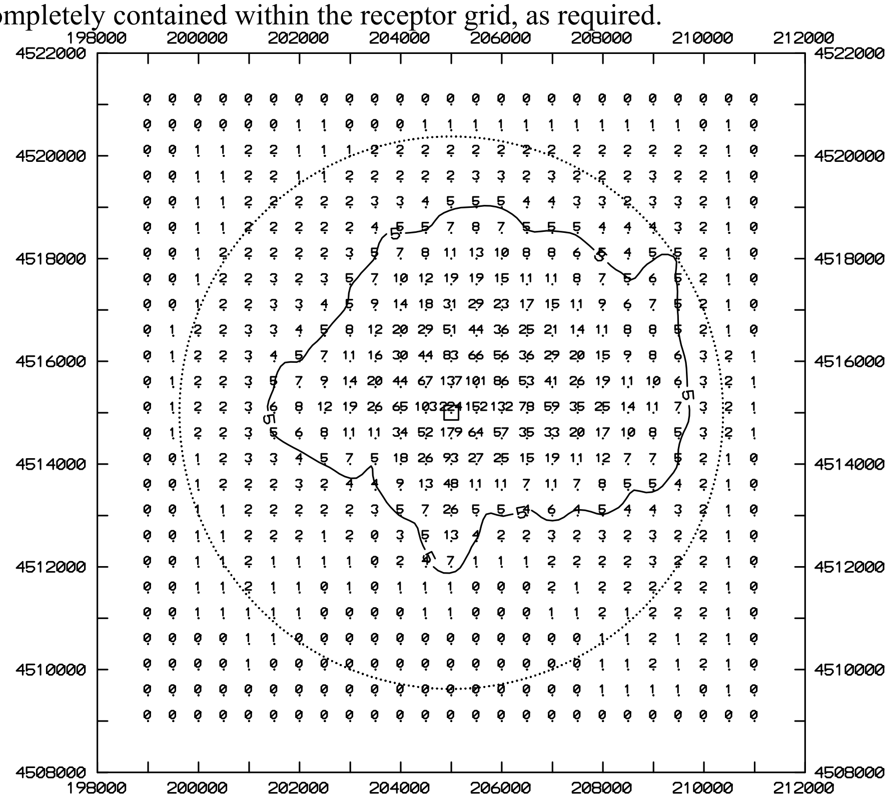


Figure 7. Plot of pollutant concentrations showing the 5 μg/m^3 significance level and the radius of impact (dashed line circle), determined from the greatest lineal extent of the significance level from the source.

7.1.1 Prepare the ROI analysis as follows:

I. Select the model that will be used for the analysis. It is usually quicker in the long run to use the same model for the radius of impact analysis as will be used for the refined analysis.
II. Model the entire facility to determine the ROI, not just the new modifications. Suggestion: Plot your sources to verify locations and identify typographical errors.
III. Set up the receptors as described above. Make sure the receptor grid extends far enough in every direction to capture the entire ROI.
IV. Optional step: Calculate the elevations of all sources, receptors, and buildings. This complex terrain analysis is optional for the ROI run, but it may save time to do it now.
V. Optional step: Add buildings and analyze them with BPIP or equivalent programs. This building downwash analysis is optional for the ROI run, but it may save time to do it now.
VI. Choose modeling options, as appropriate.
VII. Make sure that all sources and operating scenarios are modeled according to the guidelines in sections 4 and 5, above.
VIII. Run the model.

7.1.2 Analyze modeling results to determine ROI

I. Determine a radius of impact for each pollutant for each applicable averaging period. The largest ROI is designated as the ROI for that pollutant.
II. The ROI for NO_2 may be determined using Ozone Limiting Method (OLM) or Ambient Ratio Method (ARM).
III. Concentrations inside the facility's fence line can be ignored when determining the ROI.
IV. If no concentrations of a pollutant are above the significance levels for that pollutant, then the ROI for that pollutant is 0. Skip to Step 3 for that pollutant.
V. It is acceptable to scale impacts from one pollutant to determine impacts from another pollutant if several pollutants vent from the same stack and the ratios of emission rates and the averaging periods are the same.

Proceed to Step 2 for each pollutant with an ROI greater than 0.0

7.2 Step 2: Refined Analysis

The entire area of significance must be included in the analyses for all averaging periods for each pollutant. If the ROI was determined using coarse grids, then the entire ROI must be modeled with appropriate grid spacing. If the ROI was determined using appropriate grid spacing, elevations, and building downwash (if applicable), then only the significant receptors need to be modeled for the refined analysis.

Once the ROI is determined for a specific source, neighboring sources need to be included and a cumulative impact analysis needs to be performed. As the ROI analysis is concerned with significance levels, the refined analysis is concerned with NAAQS, NMAAQS, and PSD Class I and Class II increments. The concentrations produced by the facility plus surrounding sources must be demonstrated to be below these levels in order to issue a permit under the regular permitting process.
Operating permit Note: For Title V sources modeling under 20.2.70.300.D.10 NMAC (10) that are not obtaining an NSR permit, the surrounding sources and background concentrations do not need to be added to the model, and PSD increment does not need to be modeled. Other steps remain the same.

7.2.1 Prepare the Refined Analysis as Follows:

I. If a screening model was used to determine ROI, the modeler may wish to use a refined model to reduce the area of significant impact. If so, return to *Step 1* and repeat the step with the new model.
II. Prepare a new modeling input file from the ROI file.
III. Fill the ROI with receptors with appropriate spacing (or discard receptors below significance levels if appropriate spacing was used for the ROI analysis).
IV. Add receptors near areas of high concentration if these areas are not contained within a **very fine** grid. The modeling run must definitively demonstrate that the maximum impact has been identified. Concentrations should "fall off" from the center of the fine grid.
V. Add surrounding sources to the input file, as described in *Neighboring Sources/Emission Inventory Requirements*, above, and in the Bureau's "NM Surrounding Source Format and Options" document. Include PM2.5 surrounding sources if particulate modeling is required. Suggestion: set up source groups so that impacts from the facility alone, from the PSD increment consuming sources, and from all sources can be analyzed in a single run and compared with each other for determination of culpability.
VI. Building downwash analysis must be included in the refined analysis, if applicable.
VII. Terrain elevations must be included in the refined analysis, if applicable.

7.2.2 Analyze the Refined Modeling Results

I. Make sure the maximum impacts for each averaging period fall within a fine enough receptor grid to identify true maximums. Include **very fine** grids near adjacent sources and in "hot spots".
II. Compare the highest short-term and annual impacts from all sources with NAAQS and NMAAQS.
III. Determine if there is a violation of PSD Class II increment within the area defined by the radius of impact by the group containing all PSD increment consuming sources .
IV. Determine if there is a violation of PSD Class I increment within any Class I area.
V. If the facility alone will violate any NAAQS, NMAAQS, or PSD increment, then the permit cannot be issued through the normal process. Please contact the Bureau for further information.
VI. If there are violations of the NMAAQS or NAAQS at any receptors within the ROI, the next step is to determine if the facility being modeled significantly contributes (see significance levels in Table 6) to the violation at those receptors during the same time period(s) that the violation occurs. If so, the permit cannot be issued through the normal process. See non-attainment area requirements, below.
VII. If no violations are found, or if the facility does not contribute amounts above significance levels to the violations, then the facility can be permitted per the modeling analysis.

7.2.3 NMAAQS and NAAQS

All sources are required to submit NMAAQS and NAAQS modeling. The total concentrations of all facilities and background sources are required to be below the NAAQS. The steps required for this analysis are outlined above.

7.2.4 PSD Class II increment

PSD Increment modeling applies to both minor and major sources. If the minor source baseline date has been established in the Air Quality Control Region (AQCR) in which the facility will be located, then PSD increment consumption modeling must be performed. If the minor source baseline date has not been established in that region, then only PSD major sources must perform this analysis.

Portable sources that are not located at a single location continuously for more than one year are not required to model PSD increment consumption.

The steps required for this analysis are outlined above.

The same significance levels that apply to NAAQS and NMAAQS standards are assumed to apply to PSD Class II increment as well.

7.2.5 PSD Class I increment

If a PSD Class II increment analysis is required and the proposed construction of a minor source is within 50 km of a Class I area (see Figure 1), then PSD increment consumption at the Class I area(s) must be determined and compared with the Class I PSD increment. If the proposed construction of a PSD major source is within 100 km of a Class I area, then PSD increment consumption at the Class I area(s) must be determined and compared with the Class I PSD increment. The PSD permit process requires a more thorough Class I analysis, which is described in *Step 6*.

See *Receptor Placement*, above, for receptor instructions.

Proceed with the Class I area analysis similarly to the other analyses described above. However, significance levels do not apply for determining whether or not a facility contributes significantly to an exceedance in a PSD Class I area. Likewise, the ROI is not part of the criteria used to determine if a PSD Class I analysis is required.

7.3 Step 3: Portable Source Fence Line Distance Requirements for Relocation

Skip this step if the facility is not a portable source.

Portable sources should model fence line distance requirements for relocation purposes. For this modeling, use meteorological data that the Bureau has approved for relocation modeling, which may be different from that used for the rest of the modeling for the facility. Model the facility without haul roads or surrounding sources, but include co-located facilities if the desire is to be able to co-locate with other facilities at the new locations. To determine setback distance, draw a line connecting the concentrations where they drop off to the point that are just under the ambient air standard or PSD increment. Make sure to add background concentration before determining the isopleths for ambient air standards. From each point on the isopleth line, determine the distance to the nearest source (excluding haul road sources). The setback distance is the largest of these distances. Setback distance is typically rounded up to the nearest 10 meters that is above the calculated value. An example setback distance determination is pictured in Figure 8, below.

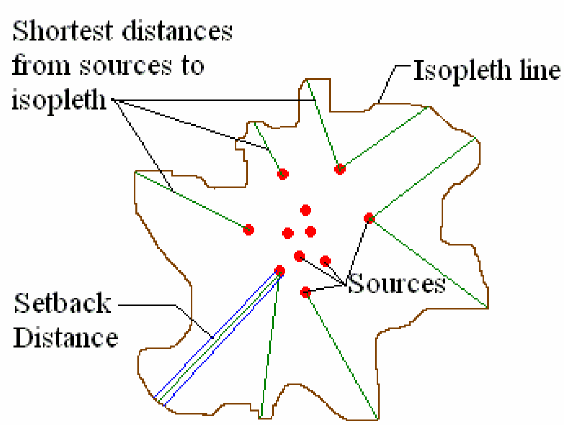


Figure 8: Setback Distance Calculation

Fine spacing is suggested within the property boundary for relocation requirement modeling.

If the applicant does not perform fence line distance modeling, relocation distance will be assumed to be the distance from the edge of a facility operations to the most distant point on the initial fence line. An irregular or elongated fence line shape can result in relocation requirements that require very large properties to be fenced off in order to relocate there without submitting modeling for each new location of the facility.

7.4 Step 4: Non-Attainment Area Requirements

Skip this step if all modeled concentrations are below NAAQS, NMAAQS, and PSD Increments.

If the modeling analysis of a source shows that the impact from any regulated air contaminant will exceed the significance level concentrations at any receptor which does not meet the NMAAQS, the source will be required to obtain emissions offsets of at least 120% of the proposed emissions and demonstrate a net air quality benefit. The net air quality benefit has been interpreted in the past by the Bureau to be a reduction of at least 20% of the maximum modeled concentration. The offsets and net air quality benefit must be from actual emissions, not from allowable emissions, and the offsets must be quantifiable, enforceable, and permanent. For more information regarding offsets, see **20.2.79 NMAC** – Non-attainment Areas. The net air quality benefit may be demonstrated by modeling actual emissions before and after construction and showing a reduction in modeled concentrations of at least 20%.

7.5 Step 5: Modeling for Toxic Air Pollutants

Skip this step if there are no toxics to model at this facility. See section 2, "New Mexico State Air Toxics Modeling", to determine if modeling of toxics is required and for other details about toxics regulatory requirements.

I. Model the toxic air pollutants similar to the way the other pollutants were modeled, as described above in steps 1 and 2. Use an 8-hour averaging period, complex terrain, and building downwash.
II. No surrounding source inventory exists for the toxics, so model only your facility.
III. Make sure a fine grid is used in the area of maximum concentration.
IV. If more than one toxic pollutant is being modeled and they use the same stacks at the same ratio of emission rates, it is allowable to scale the results of the first pollutants by the emission rate ratio to determine the concentration of the other toxics.

If modeling shows that the maximum eight-hour average concentration of all toxics is less than one percent of the Occupational Exposure Level (OEL) for that toxic, then the analysis of that toxic pollutant is finished. Report details about the maximum concentrations in the modeling report. Otherwise, perform BACT analysis or health assessments, as required. Contact the bureau on how to proceed if the $1/100^{th}$ of the OEL is exceeded.

7.6 Step 6: PSD Permit Application Modeling

Skip this step if the facility is not a PSD major source.

PSD sources and requirements are defined in NMAC 20.2.74.303 to 305. New PSD major sources and major modifications to PSD major sources must submit the following modeling requirements in addition to the regular NSR modeling requirements listed above. Minor modifications to PSD major sources are only subject to regular NSR modeling requirements listed above, as required under NMAC 20.2.72.

Sources subject to PSD requirements should consult with the Bureau to determine how to proceed in the application process. For PSD applications, a modeling protocol is required for review. Please refer to EPA's *New Source Review Workshop Manual.* The following items are required for PSD permit applications and supersede other modeling requirements in this document.

7.6.1 Meteorological Data

Applicants may need to collect one year of on-site meteorological and ambient data to satisfy PSD requirements. In some cases, it may be advantageous to begin collecting on-site meteorological and ambient data to ensure that it is available at a site that may become PSD in the future. A company considering a monitoring program is advised to consult with the Bureau as early as possible so that an acceptable data collection process, including instrument parameters, can be started. Generally, the following meteorological parameters will be measured: wind direction, wind speed, ambient air temperature, solar insolation, ΔT, and σ_θ. For further information on meteorological monitoring Refer to EPA's *Guideline on Air Quality Models* and *On-Site Meteorological Program Guidance for Regulatory Modeling Applications*. Refer to *Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD)* for ambient monitoring guidance. In addition, a monitoring protocol and QA plan **must** be submitted and approved prior to beginning collection of data for a PSD application if these data are to be used for the analysis.

In the absence of actual on-site data, the Bureau may approve the use of off-site data that the Bureau believes mimics on-site data for that location or the Bureau may approve the use of data produced by the model MM5.

7.6.2 Ambient Air Quality Analysis

The ambient air quality analysis is the same as described above, with the exception of the following points.

- If the maximum ambient impact is less than EPA's significant concentration levels (see Table 6), then a full analysis is not required.
- All sources within 100 km of the facility must be considered. Methods of eliminating non-significant impact sources from the inventory can be proposed. Discarding insignificant sources is discussed in the document, "NM Surrounding Source Format and Options"
- A total air quality analysis must also be performed for each appropriate Class I area if the facility produces concentrations greater than FLM recommended significance levels in Table 10. All sources within 100 km of the Class I area must be considered. Methods of eliminating non-significant impact sources from the inventory can be proposed. The inventories for the analysis near the facility and the inventory for the analysis near Class I areas may be quite different because they are centered on different locations.
- An analysis of Air Quality Related Values must be included in the PSD application. If the facility will have no impact on the AQRV, then that must be stated in the application (NSR Workshop Manual, Chapter D).
- There may be additional analyses required by the Federal Land Managers (FLM) for Air Quality Related Values (AQRVs). See **F**ederal **L**and **M**anagers' **A**ir Quality Related Values Work **G**roup (FLAG) for more information at: http://www2.nature.nps.gov/air/Permits/flag/index.cfm

7.6.3 Additional Impact Analysis (NMAC 20.2.74.304)

The owner or operator of the proposed major stationary source or major modification shall provide an analysis of the impact that would occur as a result of the source or modification and general commercial, residential, industrial, and other growth associated with the source or modification. This analysis is in addition to the Class I analysis, but may use some of the same techniques that were used in the Class I analysis.

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- Visibility Analysis: A Class II Visibility Analysis is required to determine impact the facility will have upon Class II areas. Analyze the change in visibility of a nearby peak or mountain for this analysis. In the absence of nearby mountains, analyze the visibility of clear sky from nearby state or local parks.
- Soils analysis: What changes will occur to soil pH, toxicity, susceptibility to erosion, or other soil characteristics as a result of the project and indirect growth related to the project?
- Vegetation analysis: What changes will occur to type, abundance, vulnerability to parasites, or other vegetation characteristics as a result of the project and indirect growth related to the project? The owner or operator need not provide an analysis of the impact on vegetation having no significant commercial or recreational value.
- Growth analysis: The owner or operator shall also provide an analysis of the air quality impact projected for the area as a result of general commercial, residential, industrial, and other growth associated with the source or modification.

7.6.4 Increment Analysis

- If the facility produces ambient concentrations greater than the significance levels in Table 6, then the Class II PSD increment analysis for the facility must use the inventory of all increment consuming sources within 100 km of the facility. No sources should be eliminated. Sources in other states should be obtained from the agency in the surrounding state.
- If there is a Class I area within 100 km of the facility (or any distance, if requested by the FLM), then receptors must be located at the Class I area.
- If the facility produces ambient concentrations greater than the significance levels in Table 10 in a Class I area, then the increment analysis for the Class I areas should use the inventory of all increment consuming sources within 100 km of the Class I area, including those sources in other states. No sources should be eliminated. Sources in other states should be obtained from the agency in the surrounding state.

7.6.5 Emission trade-offs

- If a facility is trading off emissions from another source that is not owned by the applicant, the applicant must produce a federally enforceable legal document that the state can use to force the emission reductions.

7.6.6 Emission Inventories

- The most current inventory of sources must be used. It should contain all sources currently under review by the Bureau that would be located within the appropriate inventory area. The applicant should check with the modeling staff to ensure that the inventory is up to date.

7.6.7 BACT analysis

- The analysis must follow current EPA procedures and guidelines.

7.7 Step 7: Write Modeling Report

A narrative report describing the modeling performed for the facility is required to be submitted with the modeling files. This report should be written so as to provide the public and the Bureau with sufficient information to determine that the proposed construction does not cause or contribute to violations of air quality standards. The report needs to contain enough information to allow a reviewer to determine that modeling was done in a manner consistent and defensible with respect to available modeling guidance. Do not include raw modeling output in the report, only summaries and descriptions of the output or input.

It is suggested that reports be laid out according to the following outline. The outline may also be used as a checklist to determine if the analysis is complete.

I. Applicant and consultant information
   a. Name of facility and company.
   b. Permit numbers currently registered for the facility.
   c. Contact name, phone number, and e-mail address for the Bureau to call in case of modeling questions.

II. Facility and operations description
   a. A narrative summary of the purpose of the proposed construction, modification, or revision.
   b. Brief physical description of the location.
   c. Duration of time that the facility will be located at this location.
   d. A map showing UTM coordinates and the location of the proposed facility, on-site buildings, emission points, and property boundaries. Include UTM zone and datum.

III. Modeling requirements description
   a. List of pollutants at this facility requiring NAAQS and/or NMAAQS modeling.
   b. AQCR facility is located in and resulting list of pollutants requiring PSD increment (Class I and II) modeling. Include distances to Class I areas in discussion.
   c. List of State Air Toxic pollutants requiring modeling.
   d. PSD, NSPS and NESHAP applicability and any additional modeling requirements that result if those regulations are applicable to the facility.
   e. State whether or not the facility is in a federal Non-attainment area, and any special modeling requirements or exemptions due to this status.
   f. Any special modeling requirements, such as streamline permit requirements.

IV. Modeling inputs
   a. General modeling approach
      i. The models used and the justification for using each model.
      ii. Model options used and why they were considered appropriate to the application.
      iii. Ozone limiting model options discussion, if used for NO_2 impacts.
      iv. Background particulate matter concentrations.
   b. Meteorological data
      i. A discussion of the meteorological data, including identification of the source of the data.
      ii. Discussion of how missing data were handled, how stability class was determined, and how the data were processed, if the Bureau did not provide the data.
   c. Receptor and terrain discussion
      i. Description of the spacing of the receptor grids.
      ii. List fence line coordinates and describe receptor spacing along fence.
      iii. PSD Class I area receptor description.
      iv. Flat and complex terrain discussion, including source of elevation data.
   d. Emission sources
      i. Description of sources at the facility, including:
         1. A cross-reference from the model input source numbers/names to the sources listed in the permit application for the proposed facility.
         2. Determination of sigma-Y and sigma-Z for fugitive sources.
         3. Description and list of PSD increment consuming sources, baseline sources, and retired baseline sources.
         4. Describe treatment of operating hours
         5. Particle size characteristics, if plume depletion is used.

6. If the modeled stack parameters are different from the stack parameters in the application, an explanation must be provided as to what special cases are being analyzed and why.
7. Partial operating loads analysis description.
8. Flare calculations used to determine effective stack parameters.

ii. Surrounding sources:
1. The date of the surrounding source retrieval.
2. Details of any changes or corrections that were made to the surrounding sources.
3. Description of adjacent sources eliminated from the inventory.

e. Building downwash
i. Dimensions of buildings

V. Modeling files description
a. A list of all the file names in the accompanying CD and description of these files.
b. Description of the scenarios represented by each file.

VI. Modeling results
a. A discussion of the radius of impact determination.
b. A summary of the modeling results including the maximum concentrations, location where the maximum concentration occurs, and comparison to the ambient standards.
c. Source, cumulative, and increment impacts.
d. Class I increment impact.
e. A table showing concentrations and standards corrected for elevation.
f. If ambient standards are exceeded because of surrounding sources, please include a culpability analysis for the source and show that the contribution from your source is less than the significance levels for the specific pollutant.
g. Toxics modeling results, if needed.

VII. Summary/conclusions
a. A statement that modeling requirements have been satisfied and that the permit can be issued.

Very Important: Bind Your Report! Unbound documents are very difficult to keep together. Bureau modeling staff will not be responsible for loss of parts of your analysis and subsequent incomplete rulings. Three-ring binders or plastic side bindings are preferred.

Ask the modeling section or check the web page for a sample modeling reports. The modeling report documents details the standard format for the modeling report.

A sample modeling report is available on the web page.

7.8 Step 8: Submit Modeling Analysis

Submit the following materials to the Bureau:

A. CD or 3.5” diskette containing the following:

- I. An electronic copy (in MS Word format) of the modeling report.
- II. Input and output files for all model runs. Include BEEST, ISC-View, or BREEZE files, if available.
- III. Building downwash input and output files.
- IV. Fence line coordinates.
- V. Met data, if not Bureau-supplied.
- VI. A list of the surrounding sources at the time the facility was modeled.
- VII. An electronic copy of the approved modeling protocol.

B. A typed, bound copy of the modeling report. Only the narrative report should be printed. Do not include paper copies of modeling input and output files.

8.0 List of Abbreviations

Table 21: List of Abbreviations

ACRONYM	DESCRIPTION
AQB	Air Quality Bureau
AQCR	Air Quality Control Region
AQCR	Air Quality Control Regulation (CURRENTLY NOT USED)
AQRV	Air Quality Related Values
ARM	Ambient Ratio Method
BACT	Best Available Control Technology
CO	Carbon monoxide
DEM	Digitized Elevation Model
EPA	Environmental Protection Agency
FLAG	**F**ederal **L**and **M**anagers' **A**ir Quality Related Values Work **G**roup
GEP	Good Engineering Practice
H_2S	Hydrogen sulfide
ISCST3	Industrial Source Complex Short Term Model version 3
NAAQS	National Ambient Air Quality Standards
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides
NMAAQS	New Mexico Ambient Air Quality Standards
NMAC	New Mexico Administrative Code
OLM	Ozone limiting method
Pb	Lead
PDF	Probability density function
PM-10	Particulate matter equal to or under 10 μm in aerodynamic diameter
PPM	Parts per million (volume ratio)
PSD	Prevention of Significant Deterioration
ROI	Radius of Impact
SO_2	Sulfur dioxide
TSP	Total suspended particulates
UTM	Universal Trans Mercator
VOC	Volatile organic compounds

9.0 References

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Joseph A. Tikvart (1993). “MEMORANDUM: Proposal for Calculating Plume Rise for Stacks with Horizontal Releases or Rain Caps for Cookson Pigment, Newark, New Jersey”, Joseph A. Tikvart (Model Clearinghouse), July 9, 1993.

SCREEN3 Model User's Guide (1995). SCREEN3 Model User's Guide, EPA-454/B-95-004, September, 1995. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Emissions, Monitoring, and Analysis Division, Research Triangle Park, NC.

NSR Workshop Manual, Chapter D – Air Quality Related Values

Federal **L**and **M**anagers' **A**ir Quality Related Values Work **G**roup (FLAG) Phase I Report: http://www2.nature.nps.gov/air/Permits/flag/index.cfm–
New Mexico Administrative Code (NMAC)

EPA, 1995d*: User's Guide for the Industrial Source Complex (ISC3) Dispersion Models*, EPA-454/B-95-003a, September, 1995. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Emissions, Monitoring, and Analysis Division, Research Triangle Park, NC.

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